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Panama Trade Routes

What Alterations May Be Expected

When the Canal is Opened to Commerce

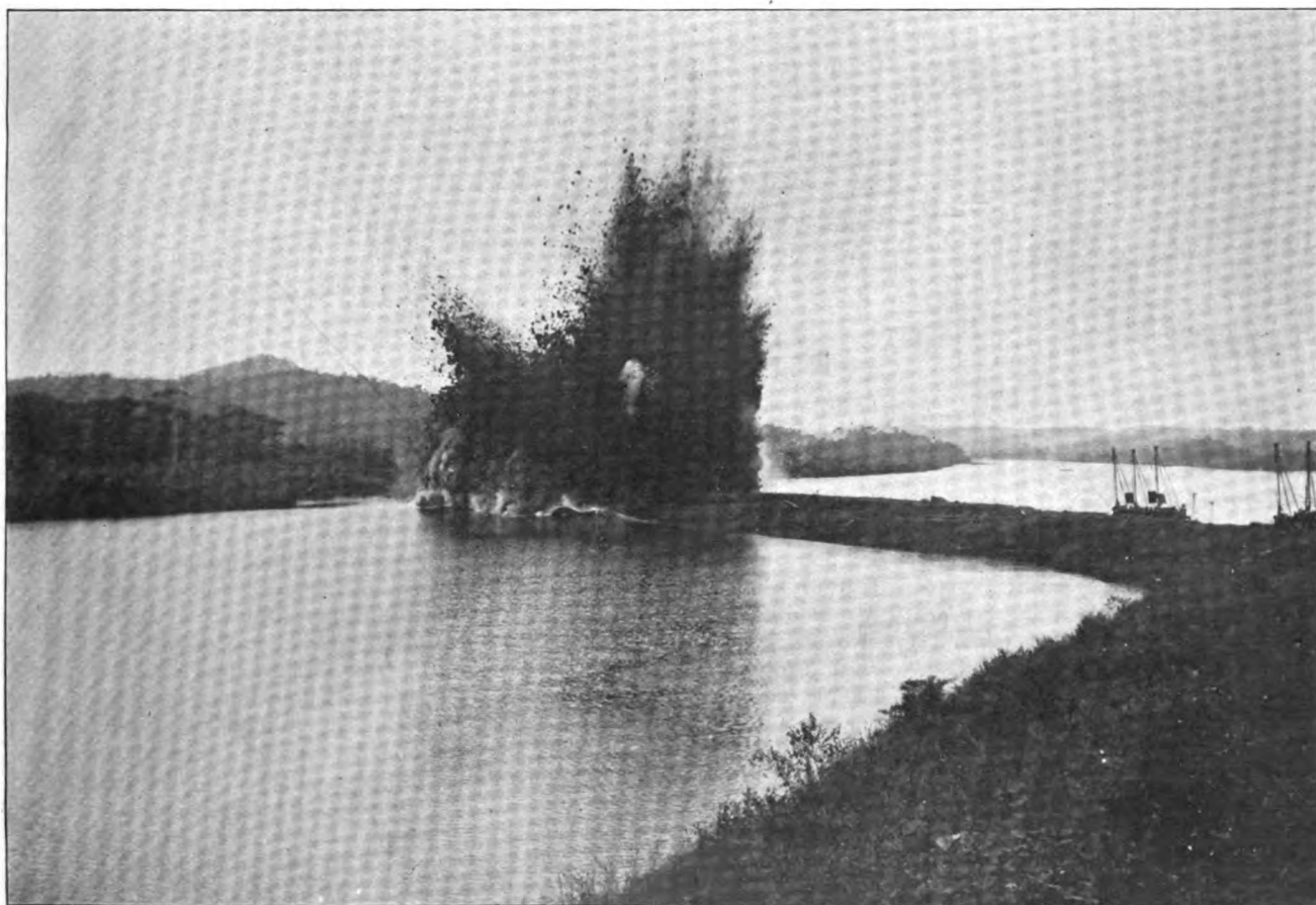
THE Panama canal will be opened to commerce some time during the present year. It will in all probability be open to ships of moderate draught within a few months. Its completion will alter many of the trade routes of the world, though it will not disturb Suez as the roadstead to India, China and Japan from Great Britain and European ports.

During the past two or three years much activity has been displayed among steamship lines in preparation for the event, though it must be admitted that foreign nations and for-

eign steamship companies have been far more active than the United States. Four steamers have been built by Cramp's for W. R. Grace & Co., New York, which are the first steamers to be constructed in the United States by this great shipping house whose headquarters are in London. During the past two years the American-Hawaiian Steamship Co. has added eight fine cargo carriers to its fleet, the last two of which are now in process of completion at Newport News. This company has hitherto utilized the Tehuantepec railway,

which runs from Puerto, Mexico, on the Gulf of Mexico, to Salina Cruz, on the Gulf of Tehuantepec. Of course, this expensive rail haul, amounting to \$2.50 a ton, will now be eliminated. Even if tolls are assessed on domestic shipping the saving will still be great as the toll of \$1.20 per ton net register works out at about 60 cents per ton of cargo.

Cramp's are building two fine steamships for Panama canal service, though no announcement has been made as to the interests for which they are building. The Fore River



BLOWING UP GAMBOA DIKE, PANAMA CANAL, OCT. 10, MAKING NAVIGATION POSSIBLE BETWEEN THE ATLANTIC AND PACIFIC

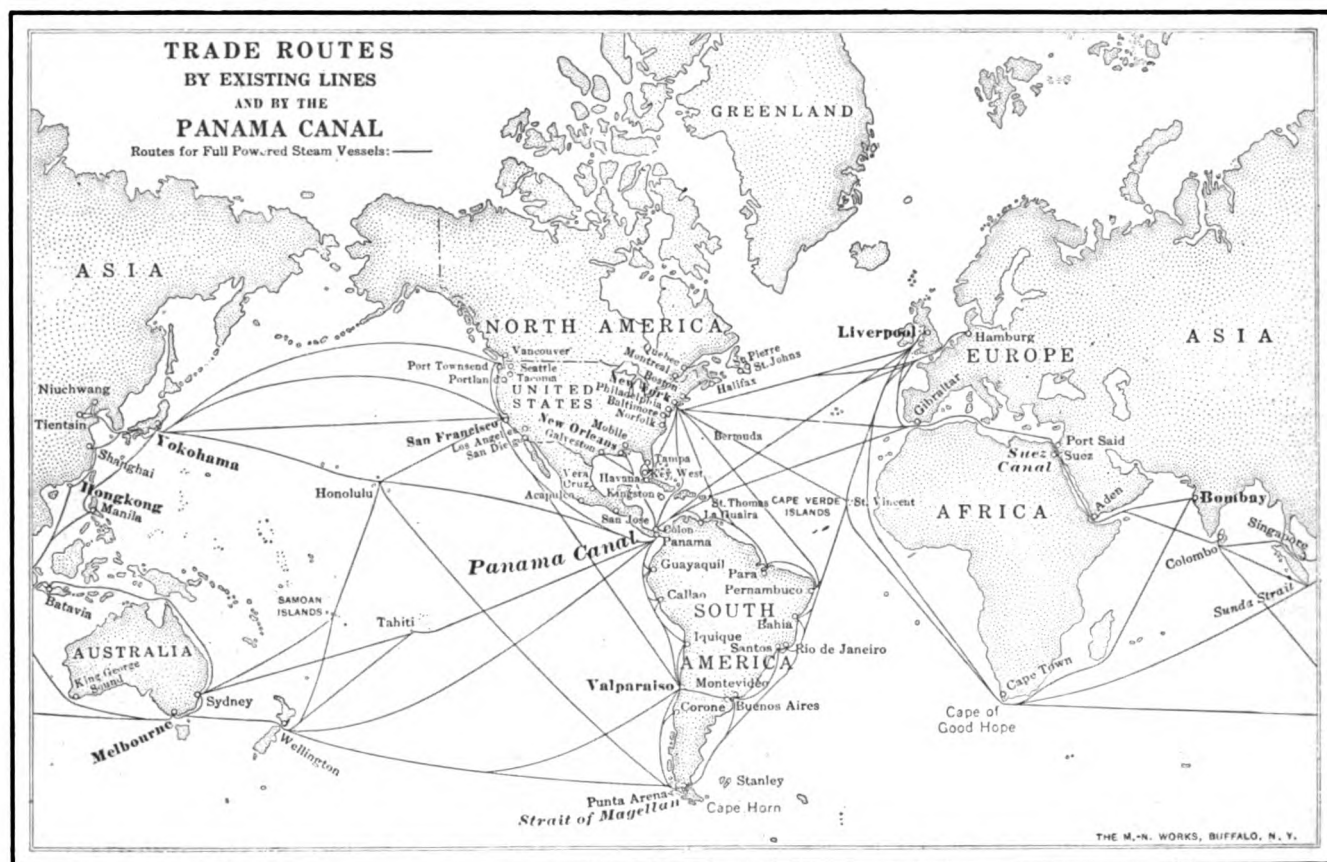
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Shipbuilding Corporation also has two steamers on the stocks for the Emery Steamship Co., of Boston, to be named Atlantic and Pacific, and as their names imply, are probably intended for Panama canal service. The Matson Navigation Co., of San Francisco, is also having a new freighter built at Newport News, and the Mallory Steamship Co., one of the oldest of the coastwise lines, is building two new steamers at Newport News. Additional vessels would undoubtedly have been built for Panama canal service if the railroads had been permitted to operate ships through the canal, but congress has disbarred them from the use of the canal. There is

Practically all of the foreign steamship lines are altering their schedules to embrace the Panama canal. The Hamburg-American Steamship Co. are building three large passenger and freight steamers for the Hamburg-South American trade, as well as additional vessels for the Atlas service to Central and South America, which is one of the subsidiary companies. The North German Lloyd has also added to its fleet new steamers of an approved design for the service through the canal. The Royal Mail Steamship Co. is also adding to its West Indian service and expects to have new steamships ready in the early part of the summer. They will

ship Co., which now has seven new 10,000-ton boats in service between New York and San Francisco, will shortly give out specifications for an additional steamer.

The greatest beneficiary of the canal will obviously be the Atlantic, Gulf and Pacific ports of the United States, which will be brought into close commercial relationship with each other. This traffic should grow rapidly and without injury to the general business of the trans-continental railroads. There are certain classes of freight which it is far more profitable for the ships to handle than the railroads, and special high class through service will continue to be



no doubt whatever but that the construction of the canal has stimulated and will continue to stimulate ship building in American yards, but the fact remains that American transportation companies have not taken the keen interest in it that foreign steamship companies have. The reason, of course, is due to the fact that the American merchant marine has never received any encouragement to enter the foreign field from congress, notwithstanding the fact that the obstacles to successful operation in the foreign field are very real and have been presented to congress time and again.

Activity abroad is pronounced.

be 10,000-ton steamers such as are at present running in the company's Brazil and River Plate route. In addition to being fitted for a large number of passengers, these steamers will have refrigeration for the carriage of fresh fruits and vegetables. Two 15,000-ton triple-screw steamers, the Alcantara and the Arianza, have already been added to the company's South American service. The French Line is developing its Caribbean service and intends to enter the trade to both the south and north Pacific coasts of America. The Holland-Amerika Line, Lamport & Holt and the Lloyd Brasileiro are also planning extensions to their service. The Luckenbach Steam-

handled by the railroads. In the conduct of this coast to coast business the Panama canal will save enormous distances. For instance, by Magellan the distance from New York to San Francisco is 13,135 miles; by Panama, 5,262 miles, a saving of 7,873 miles, or more than twice the distance across the Atlantic ocean. From New Orleans to San Francisco by way of Magellan is 13,551 miles; by way of Panama, 4,683 miles, a saving of 8,868 miles, or practically a month's steaming of vessels averaging 12 knots per hour.

The saving in distance from New York to Honolulu is 6,610 miles; from New York to Wellington, New Zea-

land, 2,143 miles; to Melbourne, Australia, 2,770 miles, and to Yokohama, Japan, 3,768 miles. There is practically no choice, however, in actual distances between the Panama and Suez routes in the steaming distances from New York to Hong Kong, China, and Manila.

The value of the canal in a commercial way to the United States in developing new territory will lie largely in reaching the ports on the west coast of South America. The first important port of the Pacific coast of South America is Guayaquil, Ecuador. A steamship bound from New York to Guayaquil going through the canal will be obliged to steam only 2,810 instead of 10,215 miles via Magellan, a saving of 7,405 miles. From New Orleans the saving would be 8,400 miles; from Liverpool, 5,198 miles, and from Hamburg, 5,060 miles. Callao, the principal port of Peru, and the next important port south of Guayaquil, is only 3,363 miles from New York via the Panama canal, whereas it is 9,613 miles via Magellan. From New Orleans the distance saved to Callao is 7,245 miles; from Liverpool, 7,443 miles, and from Hamburg, 3,905 miles. Valparaiso, the chief port of Chili, is only 4,633 miles distant via Panama, representing a saving of 3,747 miles over the Magellan route.

The world will await with interest the development of the Latin countries by reason of the opening of the canal. Their foreign trade at present amounts to about \$750,000,000, of which the United States' share is about \$277,000,000. These countries will undoubtedly want in increasing quantities our manufactures, while we will want their fruits and spices and especially their beef, as the cattle ranges are fast disappearing in the United States. The countries on the west coast of South America are much larger than the layman believes. For instance, the state of Bolivia is larger in area than Germany, France, Italy and Spain combined, or to put it in another way, larger than the states of California, Nevada, Utah, Idaho, Arizona, Oregon and Washington combined. Chili is greater than California and Montana combined, though Chili on the map is merely a narrow strip of land on the west coast of South America. Peru is equal to the combined areas of France, Germany and Austria, or Texas, Nevada, Utah, Arizona and New Mexico. Colombia has twice the area of the German Empire.

The latest available statistics show that the annual over-sea trade of Australia amounts approximately to \$672,000,000; of China, \$568,000,000; of

Japan, \$461,000,000; New Zealand, \$196,000,000; British Columbia, \$33,000,000; the Pacific coast of the United States, \$154,000,000; the Philippines, \$76,000,000; Hawaii, \$70,000,000; Alaska, \$31,000,000. This makes a grand total of approximately \$2,250,000,000.

Railroad Lake Lines

The Pennsylvania railroad has applied to the Interstate Commerce Commission for permission to retain the Erie & Western Transportation Co., which operates a fleet of package carriers on the great lakes under the title of the Anchor Line. This petition has been filed in view of the close approach of the time when railroads must cease the control of steamship lines under the Panama Canal Act, which goes into effect July 1 next. It will be heard Feb. 17.

The Pennsylvania System is undoubtedly taking this position not alone on its own behalf, but on behalf of the other railroads operating fleets of package freighters on the lakes. The claim of the Pennsylvania is that its lake line complies with the Panama Act. It should be understood that there are no independent package freight lines on the great lakes. All of the package freight lines are

merely adjuncts to the railroads which have placed ships on the lakes as an economic extension of their service to points not reached by their tracks. Obviously none of the ports on the thousand miles of waterway could be reached as cheaply by rail as by water.

Two years ago a complaint was made by Minneapolis millers that the rate to Buffalo was disproportionate as to rail and lake haul, and they chartered two vessels to operate between Duluth and Buffalo in the flour trade, meanwhile making an issue of the subject before the Interstate Commerce Commission. As soon as its contention was established, the line was discontinued and no independent line has operated since.

In point of fact the nature of the business is such that it cannot be very well handled in any other way than it is now being handled, and the only point to be considered is as to whether the rate charge is reasonable for the service rendered. Whatever the decision will be, the business will undoubtedly be transacted as heretofore, though there may be change in the form of management. In fact, pending the decision, some of the lines have already undergone tentative reorganization.

COMPARATIVE DISTANCES (IN NAUTICAL MILES) IN THE WORLD'S SEA TRAFFIC AND DIFFERENCE IN DISTANCES VIA PANAMA CANAL AND OTHER PRINCIPAL ROUTES.

To.	Via.	From					
		New York.	New Orleans.	Liverpool.	Hamburg.	Suez.	Panama.
Seattle.....	Magellan	13,953	14,369	14,320	14,701	15,397	.....
	Panama	6,080	5,501	8,654	9,173	10,447	4,063
	Distance saved.....	7,873	8,868	5,666	5,528	4,950	.....
San Francisco....	Magellan	13,135	13,551	13,502	13,883	14,579	.....
	Panama	5,262	4,683	7,836	8,355	9,629	3,245
	Distance saved.....	7,873	8,868	5,666	5,528	4,950	.....
Honolulu.....	Magellan	13,312	13,728	13,679	14,060	14,756	.....
	Panama	6,702	6,123	9,276	9,795	11,069	4,685
	Distance saved.....	6,610	7,605	4,403	4,265	3,687	.....
Guayaquil.....	Magellan	10,215	10,631	10,582	10,963	11,659	.....
	Panama	2,810	2,231	5,384	5,903	9,192	793
	Distance saved.....	7,405	8,400	5,198	5,060	2,467	.....
Callao.....	Magellan	9,613	10,029	9,980	10,361	11,057	.....
	Panama	3,363	2,784	5,937	6,456	7,730	1,346
	Distance saved.....	6,250	7,245	4,043	3,905	3,327	.....
Valparaiso.....	Magellan	8,380	8,796	8,747	9,128	9,824	.....
	Panama	4,633	4,054	7,207	7,726	9,000	2,616
	Distance saved.....	3,747	4,742	1,540	1,402	824	.....
Wellington.....	Magellan	11,344	11,760	.....	13,353	9,694	.....
	Suez	.....	.....	12,989	.....	.....	.....
	Panama	8,857	8,272	11,425	11,944	9,205	6,834
	Distance saved.....	2,493	3,488	1,564	1,409	489	.....
Melbourne.....	Cape Good Hope.....	13,162	14,095	.....	11,845	8,186	.....
	Suez	.....	.....	11,654	.....	.....	.....
	Panama	10,392	9,813	12,966	13,452	10,713	8,342
	Distance saved.....	2,770	4,282	1,312	1,607	2,527	.....
Manila.....	Suez	11,589	12,943	9,701	9,892	6,233	.....
	Panama	11,548	10,969	14,122	14,608	11,869	9,370
	Distance saved.....	41	1,974	4,421	4,716	5,636	.....
Hongkong.....	Suez	11,673	13,031	9,785	9,976	6,317	.....
	Panama	11,691	11,112	13,957	14,443	11,704	9,173
	Distance saved.....	18	1,919	4,172	4,467	5,387	.....
Yokohama.....	Suez	13,566	14,924	11,678	11,869	8,210	.....
	Panama	9,798	9,219	12,372	13,858	11,119	7,660
	Distance saved.....	3,768	5,705	694	1,989	2,909	.....
Panama.....	Panama	2,017	1,438	4,591	5,110	6,387	.....

A Sinking Schooner

The photographs published herewith are among the most remarkable ever taken at sea. The North German Lloyd steamship Berlin, bound for New York, passed the four-masted schooner Marjory Brown about 200 miles outside of Sandy Hook foundering as the result of having sprung a leak in a heavy gale. She was loaded with coal at the time. The log of the Berlin shows that she arrived alongside at 10:09 a. m. and that at 10:11, or two minutes later the Marjory Brown had disappeared. The five photographs were taken by C. W. Ward, Kissimmee, Fla., from the deck of the Berlin and show with great clearness with what rapidity the Marjory Brown went down. The first three pictures show the disappearance of the hull. The fourth picture shows nothing but the foremast sticking out of the water, and there can also be dimly seen the lifeboat putting off from the wreck with the crew of the sinking schooner. The fifth picture shows the life boat going towards the Berlin, but the Marjory Brown has totally disappeared.

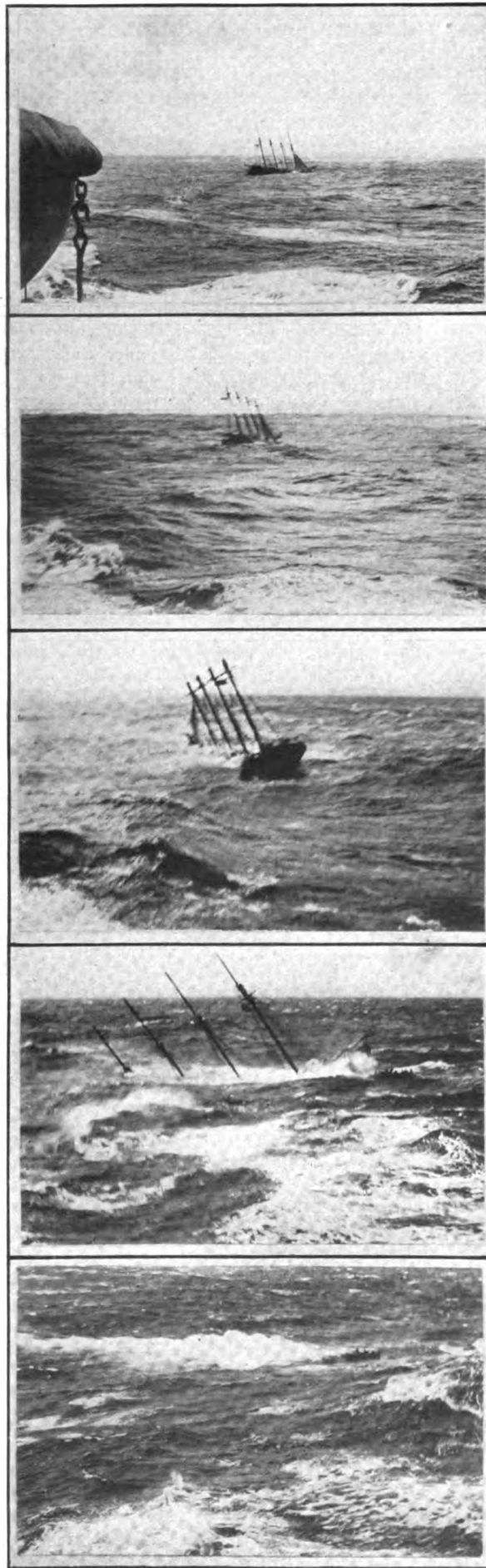
Chief Surveyor

Westcott S. Abell, professor of naval architecture at Liverpool university, has been appointed to succeed the late Dr. S. J. P. Thearle in the office of chief ship surveyor to Lloyds Society. Charles Buchanan, who was Dr. Thearle's senior assistant, has at the same time been promoted to the position of principal of the chief ship surveyor's staff.

Prof. Abell, who was born in 1877, has had a distinguished career. His professional education commenced in the Royal Naval Engineering College, Devonport, and was continued at the Royal

Naval College, Greenwich. In 1900, he was appointed to the Royal corps of naval constructors; from 1904 to 1907 he was professional secretary to the director of naval construction, and for the next three years (following in the steps of the late Sir William H. White and Sir William E. Smith) he held the position of instructor in naval architecture at the Royal Naval College. In 1910, he was selected to fill the chair of naval architecture at Liverpool university. The professional reputation which he has won for himself, at a comparatively early age, is illustrated by the fact that he was appointed last year by the board of trade to be a member of the load line committee, which is now sitting to consider the existing freeboard tables, and was selected as chairman of a subcommittee to prepare draft rules for submission to the international conference to be held later on. Prof. Abell's duties in this capacity have involved the investigation of the relation of strength of structure to freeboard and also an exhaustive comparison of the varying rules and practice of the several classification societies. Among the technical papers which have been read by Prof. Abell may be mentioned one on the general action of capsizing forces, before the Liverpool Engineering Society, and one on methods of calculation for investigating the safety of ships in damaged condition, before the Institution of Naval Architects.

Charles Buchanan, for whom the office of principal of chief ship surveyor's staff has been created, is one of the best known and most popular naval architects of the day. He has been associated with mercantile shipbuilding throughout his career. Prior to joining the service of Lloyds



SHOWING THE SCHOONER SINKING

Register in 1880 he held the position of chief draftsman with the well known firm of A. McMillan & Sons. Later he enjoyed a varied experience of his profession in various shipbuilding ports in the country. Since 1891 he has been stationed in London, holding for the last seven years the position of assistant to the chief ship surveyor. For many years past he has been associated particularly with the duty of dealing with plans of vessels submitted for the committee's approval, and this work has given him a probably unique knowledge of all the latest developments of shipbuilding practice throughout the world. Mr. Buchanan has lately been appointed by the board of trade to be a member of the departmental committee on bulkheads and watertight compartments in ships.

Chilean Submarine Boat

The submarine boat Antofagasta, building at the yard of the Seattle

presented Senorita Alvira Plaza, the young daughter of Capt. Charles C. Plaza, of the Chilean Naval Commission, who acted as sponsor, with a beautiful silver clock suitably engraved to commemorate the occasion.

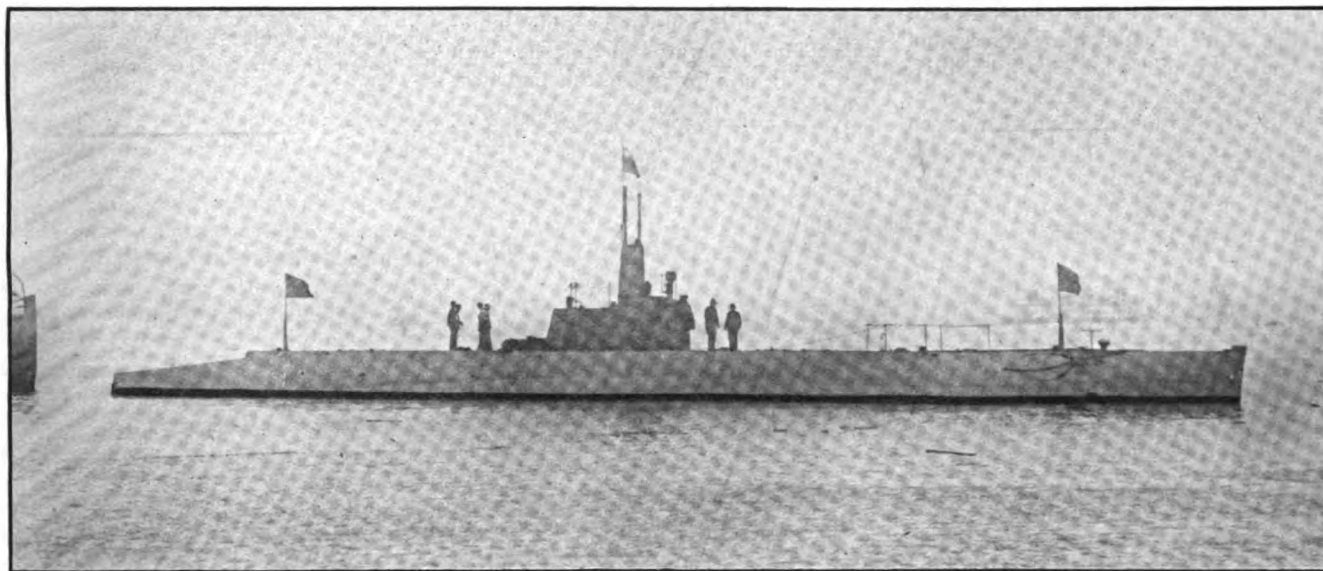
The Pig as a Pet

Of all the domesticated animals the pig is the most maligned and misunderstood. He is good natured, affable, companionable, intelligent, and, if given the opportunity, cleanly, far more so in fact than either the horse or cow. He dearly loves a bath and will murmur his appreciation with the gentlest of grunts. George L. Norton, in the *Marine Journal*, tells a little story which will be appreciated by all who are familiar with the good points of a pig. He says:

"While making a voyage from Cuba to New York in a brig deep loaded with molasses in February, 1860, when there was a period of ten days that the sun did not shine and the seas

when his name was called.

"Just before dark one day the mate, an original Yankee, took 'Dick' into the lee scuppers, gave him a good scrubbing, dried him off with a bit of canvas and sent him below in the cabin. I was second mate and it was my first four hours out. I saw nothing of 'Dick' during the time. When I went to call the mate at eight bells, judge of my surprise to find 'Dick' in the berth with 'his nibs' and both steaming hot. When I went below a short time after, I induced 'Dick' to crawl in the berth with me, and through this means I got warm and partly dry for the first time in ten days. Later we got out of provisions and poor 'Dick' had to be sacrificed. No one wanted to kill him, and we drew lots. The mate who conceived the cute idea of getting warm through 'Dick' as a bedfellow, was obliged to cut his throat to furnish food for his shipmates. The first meal off 'Dick's' remains was really a sad one. We



THE CHILEAN SUBMARINE BOAT ANTOFAGASTA, BUILT BY THE SEATTLE CONSTRUCTION & DRY DOCK CO.

Construction & Dry Dock Co., Seattle, Wash., for the Republic of Chile, was launched on Dec. 31. Just prior to breaking the conventional bottle of wine, the Rev. W. J. Noonan, pastor of St. James Cathedral, Seattle, blessed the vessel and sprinkled holy water on her steel prow, following a custom observed at the launching of all Chilean war craft. The Antofagasta is a sister craft of the submarine Iquique, launched at the Seattle yard on June 2 last year.

The submarine is being constructed under the supervision of T. S. Bailey, Pacific coast manager of the Electric Boat Co. Following the ceremony a luncheon was served at which President J. V. Patterson, of the Building company, acted as toastmaster. He

ran mountains high, so that there wasn't a dry place or a dry rag of clothing on board and no fire in the cabin to dry our wet duds, consequently we had to 'turn in' in damp clothing when it was our watch below. We had a pet pig on board which had become a favorite with all hands aft as well as forward. 'Dick', for that was his name, was a clean, pink-skinned shoat that would weigh about 75 pounds. Our sympathies grew to favor him as the weather became worse and our chances for ever ending the voyage successfully grew more slim. We began to allow 'Dick' to come into the cabin whenever he liked. He recognized the favor and was exceedingly chummy and polite, answering in the usual pig vernacular

had delayed his murder, however, until all hands were nearly famished, hence our cannibalism."

Quite a number of transfers have been made among the surveyors of Lloyds Register of Shipping since the beginning of the year. T. Dawkins has been transferred from New York to Philadelphia in place of Evan Edwards, who has been transferred to Cleveland to succeed Octavius Narbeth. Mr. Narbeth has been transferred to Philadelphia to succeed D. Millar, who goes to Baltimore, vice H. C. Farrar, who returns to England. J. Blackett has been transferred from Quebec to San Francisco as senior surveyor in place of Capt. Metcalf, deceased. J. Stewart is made exclusive surveyor at San Francisco.

Electric Collier Jupiter

Mr. Emmet's Paper on This Subject Provokes a Spirited Discussion

A PAPER which attracted great interest at the December meeting of the Society of Naval Architects and Marine Engineers was W. R. L. Emmet's paper on "Electric Propulsion on United States Collier Jupiter", which is abstracted as follows

Mr. Emmet's paper on "Electric Propulsion on the U. S. S. Jupiter" was as follows:

The contract for propelling machinery of the U. S. collier Jupiter was awarded by the government to the General Electric Co. in June, 1911. The designs had been made during the previous year when it was expected that the ship would be built in a private yard. The ship was built at the Mare Island navy yard, and was put in commission Sept. 15, 1913. Since that time she has made a number of trial runs in San Francisco bay and at sea, but she has not yet had her official trials.

The Jupiter is a very large vessel of about 20,000 tons displacement, and is designed to carry about 12,000 tons of coal and oil. The length of her deck over her cargo space is occupied by a line of derricks, which must add considerably to the weight and wind resistance of the ship.

She is a sister ship of the colliers Cyclops and Neptune. The Cyclops was equipped with reciprocating engines and has been in operation for some years. The Neptune was equipped with turbines connected to the propellers by helical gearing.

The Jupiter is equipped with one turbine generating unit and two induction motors, one driving each of the propeller shafts. There is also a board carrying switches and instruments.

A comparison of the equipment of these three vessels is given by the following table:

The character of the apparatus installed in the Jupiter is all of a type commonly used in the electrical industry and need not be described in detail here. There is only one fea-

ture about the generating unit which is different from the type of units ordinarily used for electrical purposes, that is, that the governor is so designed that it can be set to hold any desired speed through a wide range, the adjustment of the governor being normal method of speed variation used in this vessel. The ship can also, if desired, be controlled by the throttle, so that the governor is simply a convenience and in no sense a limitation.

Windings of Generator

The windings of the generator, which carry the alternating current, are on the stationary part and are insulated with non-combustible material. The generator drives its own ventilating air by powerful impellers attached to the ends of the rotor. This air is delivered from the top of the generator through a duct which connects to the space from which the fire room blowers take their air supply. The heated air from the motors also passes out of the engine room through similar ducts. The revolving parts of motors are connected to water-cooled resistances through collector rings, and means are provided by which these collector rings can be short circuited so that the rotor circuits are closed upon themselves. Such a condition, with the resistances cut out, is the normal state of efficient operation, the resistances being used only for the purpose of giving a large torque in reversing. The vessel can be operated with the resistances continually in circuit. With this connection, the immediate movement of either motor in either direction is very convenient, and this method of operation is normally used in maneuvering in narrow waters or about wharves. The ship can, however, be maneuvered and reversed without the use of the resistance, and while this method has not yet been fully experimented with, it is thought that her reversal, even without the resistance, will be about as effective as that of

vessels having existing types of equipment.

Since the Jupiter apparatus was designed, a method of designing induction motors has been developed which will give all the desired characteristics for reversal without the use of external resistance. Such motors will have squirrel-cage rotors, which are of a simpler character than the definite wound rotors now used. While the method of control and operation of the Jupiter is extremely quick and simple, the operations necessary with this new type of motor will be simpler still. With this new method it will be extremely easy to accomplish all the operations of speed control or reversal of either propeller from the bridge if desired.

When the first tests of the Jupiter operation were made she had been lying at the navy yard dock for four months, so that her bottom was in a very foul condition. Her speed in that condition was something like 25 per cent below normal. This produced abnormal electrical conditions, since the low frequency made necessary the use of higher magnetic densities than are desirable. Many of the conditions of these runs were very unfavorable. A large proportion of the crew were green men; in one fireroom watch a large proportion of the fireroom force were seasick. A great deal of boiler compound was used in the boilers, and the priming was excessive. The condensed water was much discolored by boiler compound, and water was at frequent intervals forced from the valve packings.

Operation of Apparatus

The operation of the apparatus during these runs was exactly in accordance with expectations. The turbine ran with a very perfect balance, and ran just as steadily in rough water as in smooth. The governor held its speed perfectly. The lifting of propellers to the surface at no time caused any perceptible speed variation. The only effect of such lifting of propellers was a fall of current on the instruments showing a diminution of power delivered to the propellers. Examination of the turbine after several such runs had been made showed it to be in perfect condition, and free from rust, scale or dirt.

After this period of preliminary

	Cyclops.	Jupiter.	Neptune.
Displacement, tons	20,000	20,000	20,000
I. H. P. at 14 knots	5,600	.....	.....
Engine or turbine speed at 14 knots	88 r. p. m.	2,000 r. p. m.	1,250 r. p. m.
Propeller r. p. m. at 14 knots	88	110	135
Weight driving machinery, tons	280	156	.....
Character driving machinery	2 triple expansion engines	1 turbo-generator and 2 motors	2 turbines each with gearing
Steam consumption in lb. per s. p. h. hr.	14 (estimated)	11.2 (tested)	.....
Speed maintained on 48 hr. trial	14.6 knots	.....	13.9 knots

trials, the ship was docked, and since that time she has made a set of standardization runs and a 48-hour unofficial trial with a clean bottom. On this 48-hour trial the ship averaged 14.78 knots, the average power delivered by the generator was 5,000 Kw., corresponding to about 6,300 H. P. The average revolutions of the propeller were 115. The Cyclops in her official 48-hour run made 14.61 knots with an average of 6,705 I. H. P.

Jupiter's Power

The power required by the Jupiter in this 48-hour run is somewhat less than would be expected from the Cyclops performances, and the slip of the propellers is also less than was expected. It has been suggested that this difference might, in some degree, be attributable to the fact that in the Jupiter the torque delivered to the propellers is continuous, while with the reciprocating engines the impulses are intermittent. Careful investigation would be necessary to ascertain whether there could be anything in such a theory. It has also been suggested that there would be some advantage in the fact that the Jupiter's propellers were entirely free from racing, but since some of these tests were made in quite smooth water, this could hardly have had any effect. If no advantage is gained through these causes, it would certainly seem that the performance of the Jupiter's propellers is very creditable to Captain Dyson, who designed them.

Through a misunderstanding, the steam pipe on board the Jupiter was made much too small, so that the normal pressure at the turbine cannot be attained. The vessel will not give her best performances until this is corrected, and until an effective separator is put between the boilers and the turbine so that the efficiency of the turbine will not be affected by priming. It is believed that when these changes are made, the Jupiter can, if desired, be operated at a much higher speed than that of any vessel afloat.

The steam consumption of the Jupiter turbine and the efficiency of all of her apparatus has been determined by exhaustive tests at Schenectady, and is also accurately known through knowledge of the performances of other similar apparatus. These results are shown by the accompanying curve, and they cannot fail to be accomplished in the ship herself when all conditions are normal.

Since the preliminary trials above mentioned, the Jupiter turbine has been injured through the breaking of

a half-inch top bolt, which held the section of stationary buckets used in the first stage of this machine. On account of this trouble her official trial has been postponed, and it is hoped that the steam pipe will be changed and a separator put in before the official trial is made. A section of stationary buckets held by these bolts is the only detachable part in this turbine. Tap bolts are subject to the danger of breaking under such conditions, and we have had trouble with such method of attachment in other turbines. The matter in this case was, however, unfortunately overlooked. The trouble is easily corrected, and the accident has no significant bearing upon the demonstration which this ship has made. While this bolt destroyed all the buckets in the first stage, the turbine was still capable of operation. The turbine was taken apart because it was seen that the economy was not normal. By taking out the bolt which was adrift and clearing the damaged parts which might interfere, the ship could still have been operated indefinitely at normal speed with a very fair economy. Such arrangements could be made in a few hours.

Four years ago I presented my first paper on electric ship propulsion to this society. A year before that I had designed an equipment for the battleship Wyoming, and a proposal had been made to the government in which my designs were embodied. Since that time I have submitted several designs to the government relating to equipments of battleships which have been built. My last design applied to a case like that of the Pennsylvania, and was submitted last spring. My estimates as to the results of this equipment as compared with those which will be accomplished by the equipment which is being put into the battleship Pennsylvania are shown by the following table:

	R. P. M. 21 knots.	H. P. required 21 knots.	Pounds of steam per hr. turbines alone 21 knots	Pounds of steam per hr. turbines alone 15 knots.	Weight of driving machinery in tons.
Turbine drive with geared cruising turbines as adopted.....	222	31,700	374,000	106,000	749
Turbo-electric drive	160	29,200	305,000	91,000	598

With reasonable allowances for propellers and the motion of the ship steam required outside of the main did not affect the surface in the slight-turbines, it would appear that this estimate degree. That matter of vibration ship, which is provided with 12 boilers, could, with the turbo-electric installation of any high speed equipment, operate equally well with machinery, anyway. High speed vibrations are hard to predict. I was the whole weight saving would be perfectly certain that the bottom of 266 tons.

If my first design for a warship almost, for the high speed turbine, made over four years ago had been the ordinary bottom of a power

accepted by the navy department, the vessel produced would have been very greatly superior in respect to economy, reliability, weight, simplicity and cruising radius to any ship now afloat, and ever since that time my case has been steadily strengthening through the great improvements which have been made in high-speed turbines.

Jupiter's Installation

Since the Jupiter has been put in operation, much interest has been aroused among ship owners and ship builders, and it is probable that equipments for several large vessels will, within a short time be contracted for. If such a beginning can be made, the practical results accomplished will soon develop great activities.

After reading the paper Mr. Emmet said:

This paper describes briefly what the installation of the Jupiter is. Her equipment was designed about three years ago, and she was completed about a year ago. Her machinery was completed about a year and a half ago. The ship was only got ready for any trials about the middle of last summer. She was first run with a very foul bottom. I went out to California for the purpose of seeing her operate, and later, after I left there, she was operated with a clean bottom. She was about ready for her final trials, when they had an accident in the turbine, a little half-inch bolt, which holds together one of the detachable parts of the machine, broke off, and there was some damage done, and there was a further delay. She made a good speed on her preliminary trials, something like 14.78 knots, and the performance of the turbines was very satisfactory. When I was aboard of her the sea was rough, and the apparatus worked with perfect smoothness, you could hardly tell the main turbine was running, even if you stood alongside of it. The vibration of the

station, because it is very heavy, and in point of fact the Jupiter proved that it was. All motions in the ship are so low in period as compared with those of the turbine that they do not affect it. It is shown that the very high speed turbine which the Jupiter has operates just as well on board ship as it does on land. All the other parts of the Jupiter's installation are matters of daily experience to everybody who handles electrical apparatus, except that it is really simpler than the shore application of electrical apparatus. There is nothing electrical in the Jupiter which should give trouble. That is virtually so, because in thousands of machines, which constitute regular machines of that voltage which went out of Schenectady over a period of several years—our reports involving many thousands each year and covering several years of the operations of these machines—there were about five causes of insulation troubles recorded, and those probably due to burnouts, due to overload or some extraordinary condition. The Jupiter's turbine is not big enough to burn out her electrical apparatus, and the power is made simply for that purpose and that alone, and the whole electrical situation is greatly simplified. The Jupiter's machinery weighs 156 tons. The engines, which are used in her sister ship, the Cyclops, weigh 280 tons. The Jupiter's machinery has a water rate under the conditions specified of 11.2 lb. per shaft horsepower hour on the propellers. As to the Cyclops' machinery, I do not know what the water rate is, but assume, from various evidence that has been presented, that it is about 13.75.

Electrical Propulsion

I think the principal reason, why electrical propulsion has not been more readily taken hold of by ship-builders is that the advancement of geared turbines has been held up. About five years ago I began advocating electrical propulsion, and first made propositions to the U. S. navy for the propulsion of ships in that manner. Since that time the case has very greatly strengthened, due to the fact that the development of high speed turbines has rapidly advanced.

Now, during this time wonderful developments of the gears of turbines have also gone on, and massive ships are successfully operated with gears, and many others are being designed and planned in all sizes. No one can exactly predict what the limits of the application of gears to such purposes may be.

It is very clear to any one who

studies the conditions of steam engineering that the reciprocating engines cannot survive in place of these two practical methods. In California, when I was out there, the possible comparison suggested itself to me when I saw the two 3,000 kw. modern engines driving generators in the power station of the Pacific Gas & Electric Co. Those engines were in operation there before our first turbine was put in that station. I inquired of my friends how the turbines compared with the other engines. They told me it was the most wonderful thing that had ever happened. They said: "We burn oil in our boilers and our rate of oil consumption is a perfectly fixed top limit. When we get beyond that limit, we have certain difficulties in the operation of the boiler, and we run to a certain limit and stop there. We use engines with our twenty-one boilers, and run a certain load. When

Geared Turbines

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we put in the first turbine we found we could run the same load with twelve boilers. We thought that was an extreme condition, and then we had the water rates of the two machines measured, and we found the water rate of the engine was 24 lbs. and the water rate of the turbine was 14 lbs. " The Jupiter's turbines is at least 10 per cent better than the turbine with which that comparison was made with the reciprocating engines, and the electrical losses are only 8 per cent in the case of the turbine on the Jupiter, so that it is pretty clear that the same machine for the same reasons which have caused the removal of all reciprocating engines

from power stations all over the world, ought to have that application on board ship. When I started the turbine business, it took just two years to knock out all the reciprocating engine builders of the United States for shore work. The marine business is evidently very different. I have not exactly discovered the reasons yet, but hope I may do so.

The comparison of electric drives and gearing is a very big question, and no one can say what the limits of gear drive may be. It is improving very rapidly. The performance of good helical gearing is wonderful, as compared with what we supposed to be possible some years ago, but the electric drive is something which is in no sense problematical. We know exactly all about it, and such as it is, it is a certainty. The Jupiter proves it.

Advantage of Electric Drive

Of course, the electric drive has some enormous advantages over gearing. To get good efficiency we must have relatively high speeds in turbines, and if we have high speeds we have high frequency. If we have high frequency, it is not convenient to drive motors slowly. Furthermore, with electric drive, we do not require any reversing machinery, we have full torque in the opposite direction. We have the same turbines to back and go ahead, and we have the means of bringing the motor and propeller into synchronism, so that torque is available in a very short space of time.

Another feature of electric drive which is of very great importance in anything like a warship is that we can by simply throwing a lever change the speed reduction, we are not tied to some fixed speed reduction, but we can throw a lever and change the relations of a motor, making it 30 poles instead of 40, and so change the ratio of speed reduction.

Another advantage of the electric drive is that we save generating units and save motors. We can run a ship with two generating units, or run it with three-quarter speed with one of them, and we get a great deal of interchangeability in that way. Another way is, we can have one generator to drive the propellers. For instance, on a warship, you may have four motors on four propeller shafts. I could have four watertight compartments. If three of the watertight compartments which contained the turbine were intact I could run the ship at something like half speed, or three-quarters speed, because the thing is all separate, and the connection between them

is simply an electrical connection, and not the interlocking by steam pipes. The steam piping in the electrical arrangement becomes very small.

As to the Jupiter's turbine, while this is not a particularly good case for electrical propulsion, and while it is not the best turbine now in existence, since others have been built at a later date, yet there is no turbine in operation today that is as efficient as the Jupiter's turbine by quite a large margin. The best record I know of on a Parsons turbine is in the Dunsten station at Newcastle, in England, which shows, with a high degree of superheat, pressure and vacuum, that there is an efficiency of 68.6 on the switchboard of the power delivered available in the steam. The Jupiter's turbine, under exactly the same conditions of steam pressure vacuum and superheat, showed an efficiency of something over 75 per cent. It gave 74 per cent efficiency with considerably more superheat, because it is a machine of very high speed, and on a line of turbine development which is new, and which has greatly advanced the art.

The Jupiter's machine runs at 2,000 revolutions per minute and gives its best efficiency at an output of something like 700 h. p. This Parsons machine I speak of has 6,000 kw., or about the same capacity, possibly, and runs at 1,200 revolutions per minute.

I am telling you this to point out that the development which has advanced the turbine in the last two or three years is in the direction of the extremely high speed turbine.

I was aboard the Jupiter when she made her first run, and her performance was in exact accordance with my expectations. I did not have to learn anything about her, because I knew just what she would do beforehand. I knew what her efficiency would be, because I tested the machinery which was in use on board the ship in Schenectady, and knew more about it than I would have learned if they kept her in the navy for 120 years.

Battleship Design

Last year I brought my designs up to date on a battleship. I had been making propositions to the United States government for five years on battleships. If they had accepted the first one, they would have had a ship far better than anything that has been built here or abroad, and all those which followed might have had that improvement, but they tell me now that they want to let the Jupiter run a couple of years and then build

a geared ship, and let her run a couple of years and then talk about it a bit. I expect to be retired from the engineering business at that time, so that I do not feel very hopeful about it.

This design I made for a battleship was for a ship like one of those recently developed. If a ship is provided with 12 boilers I could run her at full speed with 10. I could save something like 300 or 400 tons of weight with my equipment. I could make her interchangeable, so that she could run with various fire rooms filled with water. I could run her at cruising speed with an efficiency equal to her full speed. That is, I could run her at a water rate of somewhere around 11.5 per h. p. for cruising speed.

The General Electric Co. has said they would put such an equipment in a new ship, or in an old ship, taking

The Jupiter's Trials

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the engines out of the old ship, and if we did not accomplish all these results, we would take out the equipment, and it would not cost the government one cent. In spite of that statement they are afraid to undertake it. I will not go to the navy department any more, because I have been thrown out of it so often. I believe, however, we shall have some commercial ships equipped in this way before long, and when we get them the navy will begin to take notice of the great advantages which we can give in a battleship.

I figure on the ships operating on the Pacific ocean, that I could in the saving of fuel and cargo space on the long voyages they make there just about pay for the change in a year and a half. The same possibility applies to an enormous number of ships now operated. I could take any ship on the North Atlantic that crosses the ocean between here and Europe and cut out an enormous amount of weight and make something like 20

to 30 per cent saving in fuel. It is a case of simple rotation that involves self-lubrication, does not involve a problem, or a problematical thing, but is what we are using in all kinds of heavy machinery on shore. We will guarantee the result, and if we do not do it you can put the engines back. I think some of the makers of gearing would do the same thing, and it is time for the business of marine engineering to develop uses of the high speed turbine, because the time is coming when every tugboat will be run by turbines, not by electricity, but by gearing, some means of speed reduction.

Spirited Discussion

The Chairman:—Will you show on the blackboard what you mean by the efficiency being 68 per cent and 74 per cent. These are terms not commonly used.

W. L. R. Emmet: There is nothing to put on the blackboard. I am referring to the Rankin efficiency, comparison with the efficiency of the steam engine. Steam has a certain energy of so many foot pounds per pound of steam, and when I say we are getting 74 per cent we are covering 74 per cent in the form of electricity of the available energy of the steam. We got as high as 80 per cent in one of the new machines.

The Chairman:—The actual efficiency of the turbine as compared with the efficiency of the perfect primary engine is 74 per cent?

W. L. R. Emmet:—Within that particular range of steam operation.

The Chairman:—I thought that was what you meant and wanted to have it understood. It does not mean the thermal efficiency—

W. L. R. Emmet:—In tests I have seen of the Minnesota turbines, I think these turbines had an efficiency of 63 per cent. In some of these large ships it is over 75 per cent on the same basis. Of course, the size of these very highly efficient new turbines is extremely small. The Jupiter's turbine is very small, although it is not an extreme case, but they are very small devices. In the case of this machine I tell you about, the 20,000-k. w. machine, its diameter over all is only about 11 ft. and its length is about 10 ft., with the casing. That is the whole thing in that box. It has about nine spaces, each a separate compartment. Any one of these spaces would run the machine at a considerable proportion of the power. These turbines are simple; you can move off the top and everything is accessible.

Frederick P. Valen:—I wish to ask

Mr. Emmet one question—it is probably so simple a matter that he has not thought it necessary to mention it. However, it is not clear to my mind exactly how you balance the power between the generators and motors in cases where you reverse and slow down and start up, etc.

W. L. R. Emmet:—The turbine is operated without the governor, the load goes off automatically, and the load comes on again. When I was on the Jupiter I did not do as many things as I would like to have done, as I was afraid the people on her would be nervous about the machinery and the handling of it. I wanted minds to get used to the simple functioning of it, and I did not get them to do very much. I knew it would be done ultimately, and thoroughly experimented with, and it takes men's minds some time to get accustomed to that, and it is not desirable to hurry them. The only effect of lifting her propellers in the sea was to see the current cut down on the ammeters a little bit, and maybe shift a valve on the turbine.

Another thing which I think is useful and is noticeable in the Jupiter is that the power required, as indicated by our measuring instruments, was less than we were told to expect by the engineering department; that is, that we got a better propulsion coefficient than had been expected. That fact, I think, may be partially attributable to perfectly uniform rotation of the propellers.

Reversing at Full Speed

Joseph H. Linnard:—I ask Mr. Emmet if among the few experiments that were made, under the circumstances he mentions on the Jupiter, there was any experimentation on the subject of quickly reversing at full speed ahead? It is known that brings very heavy strains on apparatus of any kind in propelling a ship, and is a pretty severe test of any machinery.

Ernest H. B. Anderson:—This paper is of great interest to marine engineers for the reason that a great deal of matter has been written about this system, and this installation is the pioneer of its kind in the country. It is rather disappointing that the final trial results are not available, and that the difficulties which interfered with these trials appear to have been largely due to faults in the generating unit and not in the motive power driving the propellers, which is the real novelty of this installation. In connection with the preliminary trials I should like to know if the vessel was fully loaded to the designed draught and the corre-

sponding displacement of 20,000 tons.

The test of the steam consumption per shaft horsepower for the turbine is exceptionally good, but I think this result was obtained whilst the machine was under test on shore and not during any sea trials.

It is, however, in no way a conclusive argument as a comparison with a sister ship having another type of machinery, for the reason that the shaft horsepower upon which the figure was based is not given, but I believe the original design called for an estimated shaft horsepower of 7,000 for 14 knots speed of the vessel.

Bureau of Steam Engineering

The estimates Mr. Emmet puts forward for an electrical installation for a battleship similar to the Pennsylvania are interesting, but I do not see how he can justify himself in publishing such figures until he has shown just what the system is capable of in the Jupiter.

With regard to the second last paragraph of this paper, I trust the author will see his way to withdraw this completely, for I consider it hardly seems to be a statement that should be made in the proceedings of this society.

The navy department, and especially the bureau of steam engineering, have given Mr. Emmet and his colleagues a splendid opportunity of proving their claims, and it is up to these gentlemen to make good and not belittle the marine engineers of the navy, who are forced to listen to all kinds of propositions submitted for their consideration.

It is not my purpose or wish at this time to put forward any claims or advantages for other systems of propulsion, but solely to show the members of this society that I personally consider the navy department has given Mr. Emmet every assistance in making his system a success.

In England a company has been formed, consisting of the leading electric engineers and one or two shipbuilders, and they have had to build and equip a ship at their own expense, and I feel certain they have not had the assistance of the government financially. As you all probably know, I refer to the Tynemont, which has propelling machinery somewhat similar to that under discussion, and for a complete description and various criticisms of this interesting vessel I refer you to *Engineer*, Oct. 10 and 17, and also to many of the other technical journals published in England.

In regard to the Jupiter, I got this morning the *Journal of the American*

Society of Naval Engineers, and there is a very full account of this ship in this issue, giving all the particulars of the turbines and the motors and everything in connection with the ship.

Edwin A. Stevens Jr.:—I would back up what Mr. Anderson says about the ability of the engineers in the United States navy. Although not connected with the service in any way at all, at the same time I was in the naval militia as an officer and came in contact with a number of the naval officers of the United States, and my respect for them as engineers is very high, and I think that the statement which Mr. Emmet has made in the next to the last paragraph of his paper is putting it very broad. He says: "If my first design for a warship made over four years ago had been accepted by the navy department, the vessel produced would have been very greatly superior in respect to economy, reliability, weight, simplicity and cruising radius to any ship now afloat, and ever since that time my case has been steadily strengthening through the great improvements which have been made in high-speed turbines." In regard to economy we can rely, probably, upon certain calculations, although we do know that calculations go amiss sometimes. In regard to weight, the same thing applies there. In simplicity, we might or might not. It depends whether the mechanical engineer wants to have a lot of electrical devices to bother with. The two do not seem to go together, there are lots of men who succeed in the mechanical line who cannot grasp the electrical line.

Economy of System

In regard to reliability, all I have to say is that I am surprised that a man of Mr. Emmet's ability and experience should make a statement of that character. In my short and limited experience, compared with that of Mr. Emmet, I would say that reliability is something that we cannot tell anything about until we have actually tried a thing in practice. I cannot understand Mr. Emmet making such a statement. He might have reason to believe so, but to come right out and say it would be more reliable, I fail to see it, that is, to accept it as a fact before it has been proved.

In regard to economy, I do not think there is very much question but what the combination of reciprocating engine and the turbine is an economical unit. My idea is that the combination of a reciprocating unit

exhausting into a low pressure turbine, geared to a propeller shaft was to get the highest efficiency on the turbine propeller.

Mr. Emmet talks about putting all the reciprocating engine builders down and out. All I have to say is this, that the reciprocating engine has not been, and I do not think will be for a great while perfected—they have been making improvements on it all the time. For a time the reciprocating engine was at a standstill as far as any improvements were concerned, except outside details, such as crank pin brasses, main bearings, cross head brasses, but designs and details like that have been improved. The internal parts of the engine, the cylinders and other parts, have not been improved. As late as 1905, about the time that the armored cruisers, the Washington and Montana, were commissioned, according to Capt. Dyson's paper read yesterday, they had a clearance in the high pressure cylinder of something like 28 per cent. In 1906, I believe, the new gunboat Marietta was finished, and her clearances in high pressure cylinder were a little over half, namely, about 15 or 16 per cent. Certainly, that is an awful waste of steam to have such large clearances, and it can be readily seen from the advances which have been made in reciprocating engines over the Washington and Tennessee class, and later than that, the Connecticut. Certainly our coal consumption per horsepower was very much less on the Connecticut, and one of the reasons given by eminent engineering officers was on account of the cutting down of clearances, taking out valve stems and putting in straight brasses, so that the steam could be lifted in a straight passage from the piston valve direct into the cylinders instead of going through a crooked course, and there have been other similar refinements which have increased the economy of the reciprocating engines to a very great degree.

The Delaware

The Delaware came along, and that proved to be of about the same economy as the Michigan and South Carolina, although Lieut. Commander Dinger believed that the Michigan and South Carolina are slightly better, economically, than the Delaware. The same commander estimates that in the combined system the water rate can be cut down to 8.5 lbs. per horsepower per hour. He takes as a basis all ships actually built. In the Delaware the steam pressure carried was about the same as the steam pressure

in the low pressure turbines of the Utah, and taking the water rate of the Delaware engines for the high pressure cylinders, and also the water for the low pressure turbine of the Florida, and combining the two, he gets an economy of about 8.5 lbs. of water per horsepower per hour, and that is about as good as can be expected under present practice. He also states that he thinks still further improvements can be made, and personally I do not think the reciprocating engine has been developed to its full state. I think we have still further improvements coming, although the trouble is that many engineers have been willing to put in an engine into a ship that is built today—instead of getting up a new design, they will copy an engine which was built seven or eight or ten years ago, crooked, long ports, large clearances and other wasteful features, and if the same attention had been given to reciprocating engines as has been given to turbines lately, I think the reciprocating engine would be in a much better condition today.

Conservatism of Engineers

R. H. Robinson:—As an engineer-officer in the navy, I want to say that we subscribe heartily to what Mr. Emmet says. There is not one of us who will ever know as much about the Jupiter as he does. I do not think that there is any use of our making that contention. He says that it is not a case of our not wanting the advantages that he gives, but our principal duty is to get things done for us. He says he does not quite understand—I do not think he put it that way exactly—the extreme conservatism of the marine engineer. And I will point out that they have not electrical turbines on locomotives as yet. There is one paragraph in his article as printed that seems to me to indicate somewhat the difficulties that we do not know anything about, and that we must know before we can subscribe heartily to Mr. Emmet's opinion as stated in the article, and the certainty that his scheme is always going to be better than anything else. For instance, this collier is sometimes going to have 10,000 tons of coal in it and sometimes not any. What will be the effect of that on your electrical density? What effect will that have on the operation of the motors? Suppose the governor, which is a wonderful governor, and which is completely automatic, does not always function? Suppose it happens to work like the automatic water level regulator on the Belleville? Sup-

pose you have a ship pitching heavily, will that affect your motors at all? We would like to invite the attention of the author, who has done so much for us, to the fact that the Jupiter is a naval collier, and I do not think there are any other vessels equipped with this plan of propulsion.

Question of Reversing

W. L. R. Emmet:—Mr. Linnard put the question about reversibility. I saw the ship reverse. She was going about three-quarters speed, possibly, the switch was simply thrown, there was no experiment made on that score. I do not think there would be any stress, except what might come on the propeller blades, and the conditions are not essentially different from those of any other ship in that respect. At least, I can see no reasons for there being any difference.

The question of the relative efficiency of turbines and engines is one that we do not want to discuss here at very much length, because it has been so much talked about, but there are certain underlying reasons why a turbine should be more efficient, because they can provide for the full expansion of the steam and full available energy in the low pressure ranges, whereas no steam engine can do that. By going from non-condensing to condensing on steam engines the gain is something like 30 per cent, and going from non-condensing to condensing on turbines, the gain is more than 100 per cent. There is every reason why the steam engine is necessarily inefficient at low pressure ranges, that is one reason why the turbines have been introduced, and why certain refinements will improve reciprocating engines. The history of the art would seem to indicate that the reciprocating engine for all purposes to which turbines are now introduced has been universally given up.

What I said about knowledge of the Jupiter was not intended as a reflection on the navy at all, but simply intended to imply that there is no possibility of studying that unit on board ship as it was studied in Schenectady, because we made particularly careful and analytical study of it, in which case we could vary the speed and load, and trace curves of all possible variations, speed with every kind of fixed load, and with fixed speed for pressure, superheat and other conditions. It was the first turbine of the type which we produced, and the reason we built the turbine was this—we first built one of

the machines for the earlier types, and we got permission from the government to rebuild it, because it gave us the first opportunity, the easiest, quickest opportunity of getting information about the performance of the new type. Having done that, we wanted to investigate its action thoroughly, and that is all I meant by that.

Governor on Jupiter

As to the possible failure of the governor on the Jupiter which Commander Robinson has mentioned, it would have no more effect than if you had a governor on some other ship and took it off, because the Jupiter is not dependent on the governor. There is a hand-operated throttle valve you can run her by, without any trouble and as an emergency stop. That is on the turbine, in case you should break the shaft. She has the same devices that are used on all turbines, with a friction breaker, which allows the main stop valve to close. We use a type of valve which has a tendency to close by the steam equalizing. It is a reliable means of stopping, so that the governor could be entirely left out and the ship still be operated.

The question of operation at light load would only simplify the electrical problem, because you have less load on the turbine, that is all. The turbine will run at any speed assigned to it, and run at very small load. In that case the electrical efficiency would still be very good, because you could lower the magnetic density. It is not like running an ordinary form of motor at light load, because we are not tied up to any particular voltage. We are making electricity for this specific purpose, and all copper and iron in the motors and generators is available for the most advantageous use if we adopt the best voltage.

With reference to the paragraph in the paper which has been criticised, and with regard to what I have said, I want to say that there is no one who has more respect for the engineers of the navy and naval officers generally than myself. I used to be in the navy myself, and some of the men I have criticised I am very fond of. The only thing which can be taken from a paragraph of this sort, it seems to me, is that it is simply a voluntary statement of opinion. It does not read to me like an indictment of anybody. I think I have very good reasons for all these various items as mentioned in that paragraph. I also think that some of the engineer officers of the navy have not investigated these points as they

should have done. I have invited them to investigate them, but there has not been a man sent to Schenectady to investigate electrical propulsion. There was a man detailed to report on them, but never to study the conditions.

There is a great deal in what I have been saying which is easily the subject of analysis and investigation. I have done an immense amount of work on this thing in between times, and am doing it simply as a matter of engineering interest. I have a matter of important engineering work to do, and there is nothing I want to do so little as to lose my reputation as a successful engineer. I have a great deal more at stake than any of these naval officers have. If the machine fails, it is not their fault, they would not be blamed, and I would spoil all I have done.

Study and Analysis

There is a great deal of this thing which by study and analysis can be verified, and these things that I say I think are all things which can be verified. I pointed out, when I first came before this society on this subject, that we had two fire boats operating in Chicago for a couple of years then. They have much more complicated electrical apparatus on them than these big ships would have. They are absolutely neglected, as far as the electrical details are concerned, treated in the roughest way imaginable, and they are never subjected to any electrical trouble and are entirely immune from any such troubles. I sent one of my men to Chicago to make a test of the apparatus and he found some of the brushes hanging out of the holders. He said, "How does this happen?" They replied, "The General Electric man left it that way." "When was he here?" "About a year ago." The dust was accumulated all over the stuff, and they did not know how to fix the apparatus, and yet it had run perfectly and never given any trouble.

I am perfectly justified in all the statements I make about reliability and efficiency and all those things, because they are matters of general knowledge and matters applying to every industry except the propulsion of ships. And the Jupiter, furthermore, has demonstrated and is demonstrating—Mr. Anderson speaks of the troubles in the turbine—there has been one little bolt that broke loose, unfortunately, before the ship was ready to run. They did not stop her until they heard a noise, and then they stopped the machine to fix it,

because going on a trial trip. One hour's work would have put the turbine in shape to make nine-tenths of her regular speed, if not the whole, there was nothing broken, but something loose, which was clattering in the buckets in one stage. Since the Jupiter has been standing at the Mare Island navy yard ready to run, other methods have been fitted in two battleships, and I think that the navy is making a mistake in not trying to expedite a knowledge of this thing, and to realize its importance, because all other branches of engineering do realize the importance of the turbine.

I will make my statement broad enough to cover the gearing as well as the electrical propulsion, because I have great faith in the possibilities of gearing. Sir Charles Parsons has designed a great many ships, and they have all been successful, so far as I know, and I think they will be, because everything the man has done has been successful. He is a very great man. As I understand it, Mr. Parsons had a ship ready to run before they began to talk about it in this country.

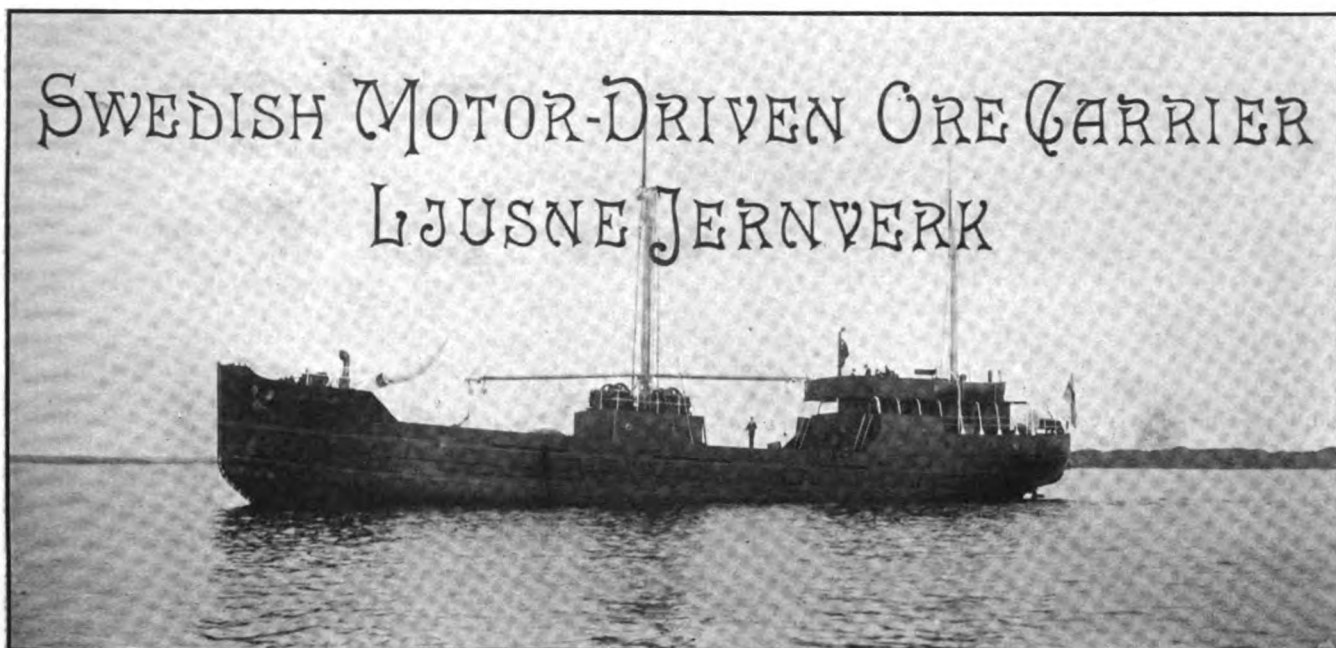
The Chairman:—I beg your pardon, that is not correct. They had begun to build the first experimental gearing at the Westinghouse works before the Vespaian was fitted up.

Ore Unloading Record for 1913

No ore or coal loading or unloading records were broken on the lakes during 1913. The most rapid dispatch in unloading obtained during 1913 was the unloading of the steamer George W. Perkins, with a cargo of 10,762 tons of Savoy ore on Aug. 21, by the installation of four Hulett electric unloaders on the Ashtabula & Buffalo Dock Co.'s dock, at Ashtabula Harbor. The Perkins went under the machines at 6:30 a. m. and left at 10:30 a. m., making the total elapsed time four hours even. Three of the machines worked four hours flat and the fourth machine three hours and forty minutes. The average tons per machine per hour was 672 and for the plant per hour, 2,747. This record, of course, while good, does not compare with the records made in 1912 and published in the 1912 report.

The port of Philadelphia is much agitated over the fact that Secretary Daniels has decided to establish the new 1,700-ft. dry dock at Norfolk instead of League Island. Numerous meetings are being held to protest against the selection of Norfolk.

SWEDISH MOTOR-DRIVEN ORE CARRIER LJUSNE JERNVERK

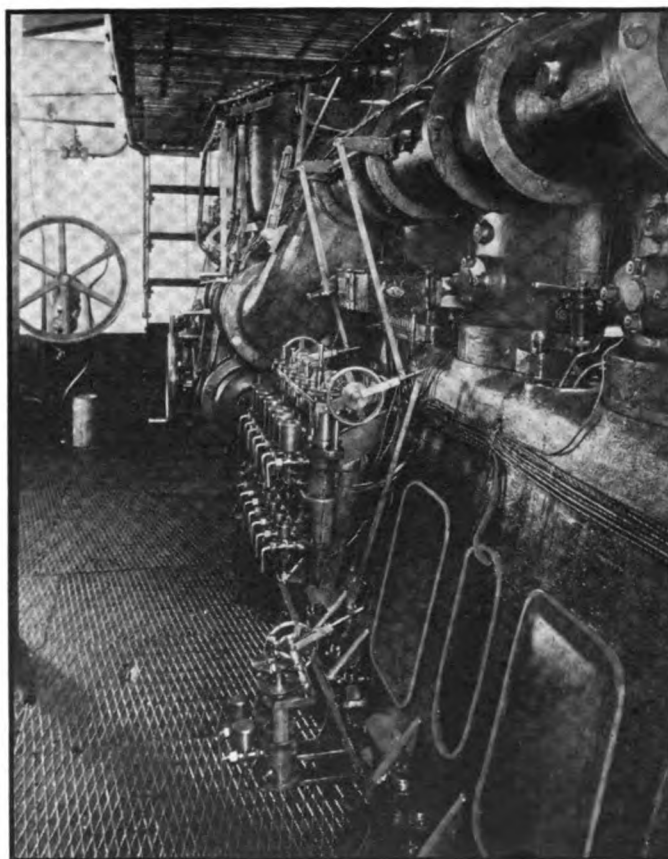


A MOTOR-DRIVEN ORE CARRIER BUILT FOR A SPECIAL TRADE

HEREWITH are published some views of the Swedish motor-driven ore carrier Ljusne Jernverk, belonging to the fleet of the Ljusne-Woxna Co., of Ljusne, Sweden, which operates large iron and steel works at Ljusne, on the eastern coast of Sweden. The company owns its own mines, the deposits being located in the middle part of Sweden. Among the company's properties are the famous Dannemora mines. In order to reach the ore deposits the vessels have to enter Mailar lake through the locks at Stockholm and from thence proceed through narrow, shallow and tortuous channels to the neighborhood of the mines. The vessels, therefore, are of limited tonnage, their capacity being confined to 700 tons deadweight. The Ljusne Jernverk is the latest addition to the fleet and is 175 ft. long, 28 ft. beam, carrying 700 tons on 11 ft. draught. The vessel is propelled by a Hesselman-Diesel engine, built in 1912 by the Swedish Diesel Motor Co. The engine has six cylinders and develops a maximum of 470 H. P. at 225 revolutions per minute, or 260 H. P. at 140 turns. She is designed for a speed of nine knots on full load. She carries her fuel in the

double bottom. The regular fuel is crude oil, but during the past year it has been difficult to obtain it at reasonable prices and the Ljusne-Woxna Co. has succeeded in developing a motor fuel from the by-products of their wood distilling plants at Ljusne and Woxna. It is understood

that enough oil is being produced to operate their fleet of ore vessels. The Ljusne Jernverk has been in commission since July 1, 1912, without a single breakdown or mishap occurring to the machinery. She has also made occasional trips across the Baltic in heavy weather without inconvenience.



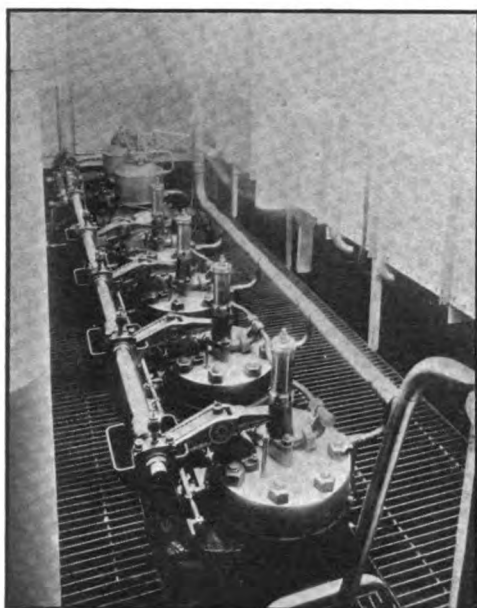
VIEW OF ENGINE ROOM OF LJUSNE JERNVERK

Handsome Profits

Steamship owners engaged in oversea traffic have during the past few years enjoyed a season of prosperity which has put into the shade any previous period that can be recalled. Of course, freights have been higher in times gone by when vessels were about one-fifth of their present size, but there has been no period hitherto of such handsome profits in large carriers. In fact, the vessel that has not paid for itself in the past three or four years has fallen below the average. However, there is an end to all good things and the period of soaring freights which began in the fall of 1910 has now come to an end. In fact, during the past three months the slump has been fast and in many instances rates are only 50 per cent of what they were a year ago. In seeking causes, the war in the Balkans, the enormous armament program of Eu-

ropean powers and other heavy demands upon great financial establishments are given by some economists as the cause of curtailments of credits which have reduced the volume of business. It is manifestly impossible, however, to put one's finger upon the immediate cause of industrial or commercial depression. There are economists who believe that coming revivals or trade can be discerned at sea quicker than they can on land. Whatever point there may be in that contention, it was certainly true in 1911 when an incredible activity existed in over-sea exchange of commodities while everything on land was apparently pursuing a leisurely pace.

The passenger trade, however, con-



ENGINE ROOM LJUSNE JERNVERK

tinues good and tonnage under construction, exclusive of warships, at the present time exceeds all previous records. These orders, however, were placed before there was an appreciable decline in freights, and most of the important builders find themselves with sufficient work on hand to occupy them during the whole of 1914.

Orders for present construction are being taken at 10 per cent less than a year ago, while the value of new steamers now in commission has sensibly declined. There are a great many second-hand steamers for sale. The unusual situation exists in Great Britain of the shipyards being busy while the vessels constructed by them are idle, but of course the reason is clear.

The United Fruit Co. has just issued a calendar containing a map of the Panama canal zone, together with a profile of the canal and some of the scenes in Jamaica reached by its ships.

Annual Report of Steamboat Inspection

The annual report of the supervising inspector general of the steamboat inspection service to the secretary of commerce for the fiscal year ended June 30, 1913, shows that during the year 7,965 vessels of all classes having a gross tonnage of 9,071,992 were inspected, an increase of 129 vessels and 316,712 tons gross. Of the vessels inspected, 450 were foreign passenger steamers of gross tonnage amounting to 3,427,314.

There were 26,482 officers of all grades licensed. Of the 7,670 applicants for original or renewal of licenses who were examined for visual defects, 84 were found color-blind or with other defects, and licenses refused.

Accidents resulting in loss of life during the year numbered 66, with a total life loss of 436. Of the lives lost 226 were from suicide, accidental drowning and other similar causes, which leaves only 210 that can fairly be chargeable to accident, collision, explosion or foundering. During the fiscal year 303,263,033 passengers were carried on steam vessels that are required by law to report the number of passengers carried. Taking the total number of lives lost as 436, it is seen that 695,557 passengers were carried for each life lost, whether of passengers or crew, and from all causes.

Overloading of Steamers

Particular attention was paid to the prevention of the overloading of steamers carrying passengers, and this practice has been materially reduced. One factor which has substantially controlled the allowance of passengers is the rules in force in regard to lifeboat equipment, for where steamers are boated according to the number of passengers carried they cannot carry a larger number of passengers than justified by their lifeboat capacity.

The actual counting of passengers carried by steam vessels has been done by the inspectors of the steamboat inspection service, as far as they have been able, and the balance by customs officers. The belief is expressed that this work should be entirely under the control of this service, which would require additional inspectors, the present available force being too small.

Careful and studious attention has been given to the matter of boiler construction and inspection, and the general rules and regulations in this regard are respected and are fre-

quently referred to by various authorities in this and other countries. During the fiscal year 3,208 boiler plates were inspected, of which 3,000 were accepted and 208 rejected for various reasons.

A very rigid examination of vessels is made at the annual inspection, but steamers would not be kept in good condition were it not for the reinspections required. Every excursion and ferry steamer is reinspected at least three times during the year for which the certificate of inspection was issued or during the season of navigation, and, while these reinspections require increased expenditure, the added expense is more than justified by the results obtained.

Power Vessels

There are said to be 250,000 power boats in the United States, and over these no direct power can be wielded either as regards passengers or machinery. The hull, tanks and piping can be inspected, but only when the vessel is of 15 tons or more and when it carries passengers and freight for hire. The number of passengers cannot be limited except by fixing the lifeboat equipment. Over motor vessels smaller than 15 tons, powers are limited to seeing them provided with the necessary life-saving equipment, lights, life preservers and means of extinguishing gasoline fires. Of the 26,482 officers licensed, 9,410 were operators of motor boats for whom no examination was required. To obtain such license one need not be a citizen of the United States, 21 years of age, or able to read and write, and no questions can be asked regarding accuracy of vision or knowledge and understanding of pilot rules. Recommendation is made that applicants for licenses as operators of motor boats be required to pass an examination as to their color sense and visual acuity and also as to their knowledge of the pilot rules and laws.

The steamboat inspection service is given by law a certain control and jurisdiction over the transportation of dangerous articles, but this control is confined to steamers carrying passengers, and does not extend to freight vessels. Because of unsafe conditions, which may arise in the transportation of articles not covered by the law and because of perils incident to the transportation of dangerous articles on freight vessels, the report recommends that the law be amended to give the service control over the entire situation with authority to make regulations covering the water transportation of dangerous articles.

Improvement of Columbia River

A Brief Glance at the Waterways of the Pacific Northwest

By W. D. Lyman*

THE new era of waterway transportation, for whose existence our country is mainly indebted to the National Rivers and Harbors Congress, has turned public attention, as never before, to the rivers and harbors of the different sections of our country. As a further great impulse to a new interest in waterways we must note the forthcoming speedy completion of the Panama canal.

While this monumental event has awakened profound attention to commerce and water routes in all parts of our nation, there is perhaps no region so fundamentally concerned in these events and conditions as the Pacific coast. And while we cannot assert that the northwest states have any greater interest than California, yet it may be safely claimed that California does not surpass Oregon and Washington in that regard.

The waterway projects of the two latter states may be embraced in three groups: Puget sound, the harbors opening on the ocean—Willapa and Gray's on the Washington coast and Tillamook and Coos in Oregon—and the Columbia river and its tributaries within the limits of both states and in addition the chief fluvial features of Idaho and western Montana, with a great area in British Columbia.

The Columbia System

It is the last named of these three, that is the Columbia system, that we will briefly consider here. It is of timely interest in connection with the great annual meeting of the Rivers and Harbors Congress, for in spite of the distance from the centers of government and population, the Columbia and its improvements have aroused more interest at the meetings for some time past than any other group of systems except the Mississippi-Ohio and the proposed coastal canal of the Atlantic.

The Columbia river rises in a chain of small lakes in British Columbia, at an elevation of 2,500 ft. above sea

level, and with a general southwest-erly course reaches the Pacific, having a total distance of nearly 1,400 miles. In volume it is surpassed only by the Mississippi of the rivers of the United States. Its mean low water outflow is about 200,000 cu. ft. per second, while its extreme flood discharge in 1894 was estimated at 1,600,000 second ft.

It can be seen that it has abundance of water for navigation. But on account of the general elevation of the Rocky Mountain and Cascade land system the Columbia and its tributaries have to move swiftly to get down to sea-level in the distance allowed.

Canals and Locks

Therefore frequent rapids interrupt navigation. Hence canals and locks become necessary.

To present most clearly the conditions and needs, we may take a bird's-eye view of the Columbia from Revelstoke, B. C., to the Pacific ocean, a distance of 1,000 miles, all of which can be made navigable without vast expense, and whose tributary regions passes resources sufficient to amply justify all needed outlay.

Beginning a rapid journey at Revelstoke we would find a magnificent steamboat course over 200 miles through the Arrow Lakes to Robson, B. C. Thence to the boundary of Washington there is mainly a good river. The Canadian government is interested to improve this, where needed, and has broached to our own government the idea of a united plan by which the entire river from Revelstoke to the ocean can be made navigable. Moving southwest from the boundary, we note a bad rapid at Little Dalles; a worse one at Kettle Falls (where canal and locks would be essential) and another bad rapids a few miles lower, Rickey Rapids. Below that point the river has long stretches of deep still water, beautiful to navigate, but interrupted with occasional rapids, not impassable but requiring removal of rocks and reefs to make navigation easy and convenient.

From Rickey Rapids to Wenatchee

is about 250 miles, and this long stretch has long been navigated in parts and sometimes in full. Below Wenatchee is a bad rapid, Rock Island, which, though passable, needs canal and locks to be profitably passed.

Yet further down, after over 50 miles of good river, comes a long, bad rapid, Priest Rapids, which, though it, too, has been passed by steamers a number of times, is so serious an impediment that regular steamer navigation has never existed. There is a fall of 71 ft. in about 10 miles; canal and locks are demanded here. Daming the river at this point and creating a water-power of 250,000 H. P. and thus accomplishing the double purpose of navigation and power sufficient to meet all expenses are among the great possibilities here.

Priest Rapids is about 415 miles from the ocean. There is a fall of about 400 ft. in that distance. It is swift in various places during the stretch of over 200 miles to Celilo, but it is navigable at all stages of water to the last named point. At Celilo occur several obstructions, the most extensive in the whole course of the river, covering a total distance of 8½ miles. Here are the famous Turnwater falls, the Grand Dalles, and several lesser rapids. Altogether they constitute one of the most remarkable points on the river. At the Grand Dalles the river runs in a chasm only 180 ft. wide at low water, but the water is from 200 to 400 ft. deep. The entire fall is 81 ft. This great obstruction has prevented steamboat navigation and has bottled up the vast productive "Inland Empire" and subjected it to very heavy transportation charges. Were it not for the great fertility and favorable climate of eastern Oregon and Washington and western Idaho, the freight rates would have hindered development to a great degree.

Transportation a Handicap

As it is, costly transportation has been a heavy handicap. By reason of this there has been a persistent demand on the Federal government to improve the river at this point. After much loss of time and some false

*President, Columbia and Snake River Waterways Association.



THE BATTLESHIP DELAWARE IN THE RECENT GALE IN THE NORTH ATLANTIC

This is a very striking sea picture and appears to show the battle ship awash to her turrets. The giant wave is, however, simply hiding the hull, not submerging it

Photo by C. V. Buck, Underwood & Underwood, New York.

moves, the Celilo canal project was taken up in earnest some four years ago. Nearly enough was appropriated by congress last spring to complete the work. It is expected that it will be done by January, 1915, at a total cost of about \$5,000,000. The great immediate need of the upper Columbia valley is that this work be pressed without flagging to a conclusion. The Federal government, together with Oregon and Washington, are looking favorably upon the project of a dam at Celilo and a water power derived from it. Sufficient appropriation has been made for a survey. Preliminary estimates indicate that a horse power of 350,000 might be generated and that the power might be sold at a paying rate of from \$8 to \$10 per horsepower a year. This is about a fifth or sixth of the charge now made by the power companies. The industrial and commercial results of the opening of the river to navigation and of the creation of such an enormous power would be beyond computation.

The upper Columbia basin is already an enormously productive country. The grain crop of the present year is probably 100,000,000 bu. The fruit and vegetable crop is probably 20,000 cars. Hay and live stock are in proportion. It is probably safe to say that the reduction in freight rates through the Celilo canal will be sufficient to pay the cost of the canal within two years.

The 200 miles of the Columbia river from Celilo to the sea is now navigable for river craft of any size at all stages of water. The great need on the lower river is a ship channel from Portland to the ocean adequate for the largest ocean vessels. The last year there has been organized "The Commission of the Ports of the Columbia," having members all the way from Lewiston, in Idaho, Walla Walla, Pasco and other cities in Washington, Pendleton, Umatilla, and others in Oregon, to Astoria, whose slogan is "A forty-ft. channel to the sea." Such a channel, with the completion of both the south and north jetties at the mouth, will attract the largest vessels to Portland, and will perform a work of transcendent importance in making the Columbia basin ready for the full results of the Panama canal and the world commerce of the Pacific.

At a regular meeting of Ogdensburg Lodge No. 10, Shipmasters' Association, held in their hall on New Years Day, the following officers were installed by Grand Treasurer Capt. H. A. Murphy for 1914: President, Capt. W. J. Stitt; first vice president, Capt. Frank P. Russell; second vice president, Capt. S. V. Anderson; Chaplain, Capt. Jas. Owens; warden, Capt. Fred. Loveless; marshal, Capt. Fred. Travis; sentinel, Capt. W. G. Bryan;

secretary-treasurer, Capt. M. A. Leonard; delegate to grand lodge, M. A. Leonard; alternate, Capt. Chas. Nelson.

After the installation ceremonies were over a social session was held and an enjoyable time spent.

The annual report of the Panama Railroad Steamship Line just submitted by Col. George W. Goethals shows that the line enjoyed a profitable year. A deficit of \$201,761 in the preceding year's statement was replaced last year by a net profit of \$221,489, thereby producing a combined increase in net revenue for the line of \$423,251. Two accidents to the steamer Advance at sea, one involving an expense for repairs of \$16,000, and the other \$4,000, were the only ones that occurred to the fleet during the year.

The steamers Owego, Richardson and McCullough, of the Erie Railroad Lake Line's fleet, will be equipped with Byerlyte flooring during the winter months. This composition is meeting with much favor on the lakes for flooring cabin quarters and deck spaces.

The United States court at Philadelphia has appointed receivers for the Breakwater Co., of Philadelphia, which has several important contracts under way in various parts of the country. Lack of working capital is given as the cause.



"Screw Propellers," by Charles W. Dyson, U. S. N. 2 vols. Volume I text, 142 6 x 9 in. pages; Vol. II, 32 18 x 18 in. 2-page plates, 1913. John Wiley & Sons, New York. Price \$7.50. For sale by Penton Publishing Co., Cleveland.

This work in the main is a resume of papers by the author published in the Journal of the American Society of Naval Engineers during the past several years. It is a valuable contribution to the literature of a subject to which the very obscurity surrounding actual working conditions and the impracticability of exact observation have lent, and continue to lend, unflagging interest as evidenced by the standing of its investigators. Captain Dyson has had access to a mine of information in the records of the Navy department and has been in close touch with its work during a period of very rapid development, and has had the further advantage of intimate association with that master-mind, David W. Taylor, in his experimental tank investigations.

His conclusions are naturally, therefore, based chiefly upon results obtained with naval vessels and from these are deduced the theory of design submitted. By far the larger proportion of propeller problems, however, arise in connection with ships not only of very different forms, but working under radically different conditions, and from those encountered in naval work and introduce factors which almost never confront the naval designer yet cannot be ignored.

The author tacitly admits so much by casting aside the idea of designing from theoretical formulae as incorrect and impractical and reducing available methods to three; on results obtained with model propellers; and on actual trials of full sized propellers in service. He eliminates the first two as unsatisfactory and adopts the third and hence is restricted to the deductions as above. Manifestly, therefore, conclusions based upon a type of ship

with fine ends, deep and practically constant draft, allowing of the use of maximum diameters working in water of maximum density and employing relatively high speeds of revolution, are hardly trustworthy in the case, say, of a full modeled cargo ship, with a single screw working in a greatly disturbed wake and restricted in diameter because of a widely ranging draft and perhaps in shoal water. Nevertheless, Capt. Dyson's work is a painstaking effort towards the solution of what must probably always remain one of the most baffling problems in engineering.

"Turbines Applied to Marine Propulsion," by Stanley J. Reed. 174 pages, 7 x 10 in., D. Van Nostrand Co., New York, publishers. Price, \$5. For sale by Penton Publishing Co., Cleveland, O.

The contents of this volume, which comprise thirteen chapters, consist of a special course of lectures which were given by the author at the Naval Architecture Department of Glasgow university during the early part of 1912. The lectures, however, form only a basis for the volume, as obviously they are greatly extended. The book is more especially intended for practical use and for this reason thermodynamic and mathematics are entered into as lightly as possible. The free use of entropy is made only on account of its forming a convenient abscissae value for the charts. Nearly all the calculations have been made by means of a slide rule and graphics and are therefore correct only to the degree of accuracy that can be obtained by these methods. The progress made with turbines since their first application to practice has been very rapid and the author believes that the pace will be equally fast in the future. After acknowledging the untiring perseverance of Sir Charles A. Parsons, he attributes the striking development of the turbine for marine purposes to the progress-

ive policy of the British admiralty under the leadership of the late Sir William Henry White, who quickly perceived their advantages and assumed the responsibility of installing them. While it will be noted that no prefix is given to the title, the book deals only with steam turbines, as the present stage of the gas turbine is experimental. Detail design, which is largely a question of ordinary engineering, is not entered into. However, the concluding chapter deals with astern turbines, cylinders, rotors, bearings, thrust blocks, steam pipes, and other details of design.

"Navigation by One Observation," by Capt. P. Thompson, 56 pages, 6 x 9 in., Longmans, Green & Co., New York; price, \$1.20. For sale by Penton Publishing Co., Cleveland, O.

This book outlines the method of finding a ship's position at sea by one observation only and is intended for officers in the mercantile marine and for yachtsmen. Capt. Thompson is senior examiner of masters and mates at Trinity House, and is the author of "Navigation Simplified." Where one observation of a celestial body only is used for finding the longitude the result cannot be verified until the latitude has been found at noon. Where two observations have to be taken to find the ship's position, a delay of two or three hours must take place to allow of a change of azimuth before the computation can be completed. These disadvantages are altogether avoided in the present work and the ship's position fixed by an altitude of either sun, moon, star and planet at any hour of the night and at almost every hour of the day when the atmosphere and weather are suitable for observations. The author says that the computation can be made by an intelligent navigator in ten minutes. The numerous examples which are worked out in the book are more graphic than any explanation. This little book should prove a very useful one to an experienced navigator.

Pollution of Lake Water

A Startling Report to the International Joint Commission— Certain Sections of Lake Water Are Unfit for Consumption

LAKE vessel owners and vessel masters should by all means procure the report of Dr. Allan J. McLaughlin, surgeon United States public health service, to the International Joint Commission on the pollution of the waters of the great lakes. Lake Michigan is not included in this report because it is not a boundary lake. The report was made to determine the following:

"To what extent and by what causes and in what locality have the boundary waters between the United States and Canada been polluted so as to be injurious to the public health and unfit for domestic and other uses."

The investigation embraced the territory covered from Rainy river and Lake-of-the-Woods to the St. Lawrence river. The portion, however, in which vessel owners will be interested is that dealing with the sections of the lakes and rivers from which they are likely to derive their water supply. For instance, it is very interesting to know that St. Mary's river is grossly polluted and that the waters of the Detroit river from Fighting Island to its mouth and out into Lake Erie practically to the islands, are not only unfit for domestic consumption but that the raw water cannot be made safe by any known means of purification. The report indicates, however, that the great bulk of the great lakes water remains in its pristine purity. Its real value lies in indicating those portions of the lakes which are dangerously polluted. The work was very thoroughly done, the number of sampling points being 1,447 and the total number of samples collected at these points was 17,784.

Dangerous Pollution

The report indicates that there is considerable, and in some localities dangerous pollution due to navigation. The quantity of pollution distributed by vessels may be appreciated when it is considered that the population on lake vessels has been estimated by the United States census as 14,000,000 persons for the season. In fact, during 1913, it exceeded 16,000,000. The largest factor, of course, in the pollution of the lakes are the municipalities which discharge their sewage untreated into the waters.

The distance that pollution may

travel in the great lakes was an interesting point developed. It was shown to travel in Lake Erie 18 miles and in Lake Ontario 16 miles. The position of intakes and the pollution existing in the vicinity of municipal water supplies is such that there is not a municipality using lake water which can be said to possess a safe water supply without treatment. In spite of these facts, until very recently the use of untreated water was the rule. The conditions responsible for the disgraceful record of water borne typhoid in these cities are the unrestricted discharge of sewage by municipalities and vessels. In certain localities the report indicates that the pollution is so great as to impose an unreasonable burden upon any known method of water purification, and where intakes are located in such localities some method of eliminating or reducing the pollution, whether from boats

Gross Pollution in Detroit River

From Fighting Island to the mouth of the Detroit river the water is grossly polluted and totally unfit as a source of water supply. It is our opinion that such raw water would impose an unreasonable responsibility on any known method of purification even with most careful supervision.

or municipalities, is absolutely necessary.

The report emphasizes the fact that it is the intermittency of the maximum pollution wherein lies the great menace to water supplies. The tendency is to put an undue confidence in a water supply which is safe "most of the time". It is difficult for officials to understand without a severe lesson that it is not sufficient to have a water supply that is safe for 360 or 361 days of the year. Such a supply with a favorable intake may escape pollution for more than a year. There was no evidence of serious pollution of the water supply of the city of Erie from 1909 to December, 1910, yet the appalling disaster of January and February, 1911, showed that pollution could take place under certain weather conditions. No water is safe that is not shown to be safe by daily bacteriological examination. Inefficient management

of any form of water purification plant may be productive of disastrous results. At a Canadian town the manager of a plant, acting under the instructions of the chairman of the water board, reduced his quantities of hypo-chlorite and obtained practically no efficiency whatever.

Thunder Bay, Lake Superior

On the subject of the waters of Thunder Bay, Lake Superior, the report says: "The examination of the waters of Thunder Bay shows that the pollution found there did not reach the international boundary, some 35 miles distant, during a period of the investigation. The combined population of Fort William and Port Arthur is at present only about 40,000, and with the enormous amount of water available for dilution of the sewage of these cities, it is unlikely that existing pollution could reach the boundary. The local situation is, however, an unfortunate one for these cities, the general tendency being to spread the sewage polluted water along the shores rather than out into the bay. The samples show that the pollution ran towards Papoose Island to the north or towards Pie Island to the south. On no occasion was it found beyond the Welcome Islands. At times pollution from Port Arthur was found to extend along the north shore for a distance of 9 miles—conditions of pollution which would seriously menace an untreated water supply taken from that source. Examination of the tap water of these two cities showed that while the Loch Lomond water used at Fort William was practically pure, that of Port Arthur, taken from Thunder Bay, showed a serious pollution on several occasions. The typhoid rate of Port Arthur is several times greater than that of Fort William. This can only be attributed to the water supply since the sanitary conditions of Port Arthur are undoubtedly superior to those of Fort William."

The report indicates that the pollution of the Detroit river at Fighting Island is 63 times greater than that of Lake St. Clair. Fighting Island divides the Detroit river into two channels. There is a great difference in the degree of pollution in these two channels. In the channel between the

American shore and Fighting Island the pollution is enormous. The channel east of Fighting Island shows gross pollution but very much less than in the American channel. The report says:

"From Fighting Island to the mouth of the Detroit river the water is grossly polluted and totally unfit as a source of water supply. It is our opinion that such raw water would impose an unreasonable responsibility on any known method of purification even with most careful supervision. Unfortunately Wyandotte, Trenton and Amherstburg are taking their water supply from this part of the river. An extensive investigation was made of the area at the mouth of the Detroit river and the western end of Lake Erie to Put-in-Bay. The examination of the large number of samples taken over this area indicates the existence of such gross pollution that the water in this part of the lake is unquestionably a very dangerous one, especially to crews and passengers of vessels using water pumped from this region. In our opinion there is no point from the lower end of Lake Huron to the islands which separate the western end from the remainder of Lake Erie from which a safe supply of water could be taken for even a portion of the 365 days in the year. The limit of the western end of Lake Erie pollution is probably in the vicinity of the islands which separate this portion from the remainder."

Lake Superior Water

Concerning the water of Lake Superior, the report says: "The bulk of the water of Lake Superior is pure, about the only possible source of pollution being from the vessels plying upon it. The population upon the drainage area of Whitefish Bay is practically nil, but the lake traffic passing through this part of the river is enormous. Samples in the ship channel along the first cross section extending from Gros Cap to a point above Bay Mills, showed average pollution greater than that existing between the ship canal and the shore. Obviously this pollution is due to boat traffic. Inshore samples show some pollution, probably due to drift from the boat channel. The cross section between Brush Point and Point Aux Pins show in this narrow channel concentration of the pollution found higher up. The third cross section just above the waterworks intake of Sault Ste. Marie, Mich., showed practically the same degree of pollution as the previous one. The water of this vicinity ought not to be furnished by

the municipality without adequate treatment of some kind. The pollution of the water shown here explains the continued excessive typhoid rate of that city. The samples from the points above the Canadian ship canal showed great increase of pollution, much of which is probably due to the concentration of shipping at this point. The use of water from such a source is extremely dangerous. Unfortunately the waterworks intake of Sault Ste. Marie, Ont., is just below this section of the river. Acute outbreaks of typhoid must always be expected from such seriously polluted water. The typhoid rates of this town have been excessively high for many years.

"Samples taken from cross sections below the towns show gross pollution continuously. This pollution was found to extend practically undiminished to Neebish Island. This whole section of the river is a very unsafe place from which to take water for ships. The pollution is general throughout the river in both channels. The fact that pollution was found to be

St. Mary's River Water Unsafe

The pollution of St. Mary's river was found to extend practically undiminished to Neebish island. This whole section of the river is a very unsafe place from which to take water for ships.

common to both channels is of importance to summer residents who frequently use this polluted water."

Concerning Lake Huron, the report says: "Examination of samples in the lower end of Lake Huron showed that this water would be practically pure were it not for the continuous pollution due to boat traffic. That portion within a radius of 3 miles from Point Edward light shows a slight though definite pollution. The slight general pollution in this portion of Lake Huron, while due in part to the large summer population and seasonal effect of streams, may be accounted for chiefly by the enormous boat traffic through the middle of this area."

Regarding the waters of St. Clair river, the report says: "The cross section at the head of the river shows a slight increase in pollution over the water of the lake, probably due to the concentration of boat traffic. The next cross section above the mouth of the Black river shows a continued increase of pollution due to the sewage discharged by Port Huron above this point and undoubtedly affected by the back currents from Sarnia Bay. The

two cross sections taken below the mouth of this river show an enormous increase in pollution in the St. Clair on the United States side. This section is below the principal sewer of the town of Sarnia. The cross section just below the site of the international tunnel continues to show marked pollution along both shores, illustrating vertical stratification. The two cross sections above Stag Island showed gross pollution extending a little farther towards the center of the stream, while the two below the island showed a gross pollution extended over the entire width of the river. The water of the river St. Clair from its head to Lake St. Clair is unsafe as a source of water supply without careful and unremitting purification. The several cross sections from St. Clair to Algonac show gross pollution of the river more marked on the United States than on the Canadian side, owing to the fact that the discharge of sewage was chiefly from the United States side, the Canadian municipalities below Sarnia not being sewered.

"The cross sections taken across the branches of the delta where the river discharges into Lake St. Clair showed the main ship channel to be the least polluted, the bulk of the pollution existing on each side having passed through the chenal ecarte and north channel respectively."

Lake St. Clair

Concerning Lake St. Clair, the report adds: "The bulk of the eastern portion of Lake St. Clair was found to be comparatively pure. Samples taken from the lake near the points where the Thames and Clinton rivers discharge indicate that these rivers do not affect the general character of the lake water beyond a very short distance from their mouths. The examinations were made in July and August and it is quite probable that when these streams are in flood, for instance in April, the pollution would extend further out in the lake. Excluding the tributary streams, the largest of which, the Thames and Clinton, were shown to have no appreciable effect at this season, there remains to be considered the pollution from the St. Clair river and the sewage discharge from vessels. It will be remembered that the cross sections at the delta of the St. Clair river showed that the bulk of pollution left the rivers by the right hand or north channel, and the chenal ecarte. The purer water, with a relatively slight pollution, enters the lake by the southwest, that is, the main ship channel.

"The conditions in Anchor Bay and that very shallow portion of the lake

north of St. Clair flats canal, are favorable for the action of sedimentation and other agencies which thin out and diminish pollution. As the drift from this portion of the lake is south toward the main ship channel, the pollution reduced by the natural agencies just mentioned probably again reaches the main ship channel. The Canadian portion of the lake is south of the line of traffic and as already stated above, shows very little pollution.

At Outlet of Lake St. Clair

"The cross section where the Detroit river leaves Lake St. Clair shows about the same degree of pollution as the lake in the center of the channel, with increased pollution across to the United States shore. The cross section at the head of Belle Isle shows considerable pollution near both shores. The results of our analyses of samples taken above the intake for the Detroit city water supply show this to be an unsafe source of supply without careful treatment. The application of hypo-chlorite of lime in quantities or by the method in vogue in Detroit during our investigation does not in our opinion represent adequate treatment. The several cross sections at this point to the site of the Michigan Central tunnel shows a marked increase of pollution in the shore samples. The water intakes of Walkerville and Windsor are both located in dangerous situations owing to the discharge of sewage above these intakes and the pollution due to navigation. In spite of the efforts made by these towns to protect their supplies by means of chlorination, the typhoid rates remain too high. At times the pollution is so great that the quantities of chlorine required to overcome it gives objectionable taste to the water.

"Investigation made of the effectiveness of chlorination in Walkerville, Windsor and Detroit showed that there were frequent breaks in its efficiency. These are probably due to lack of uniformity of the available chlorine content of the hypo-chlorite used. The tendency is to reduce the necessary quantities on account of complaints of taste and of intermittency in its administration. The cross section over the Michigan Central tunnel showed gross pollution at sample points near Canadian and United States shores and of considerable pollution extending over the entire river."

The report continued: "At Port Stanley the evidence indicates that Lake Erie is pure and such pollution as is picked up in the neighborhood of any local source of pollution is confined to that district. Samples collect-

ed in the lake along a line from Point Abino to the United States shore about 12 miles above Buffalo show Lake Erie water to be pure except that it may be influenced by the effect of navigation. This condition is further emphasized by the examination of samples taken from the cross sections at the foot of the lake before its waters become the Niagara river. It was found that pollution from Buffalo and other sources extends but a short distance beyond the breakwaters and the water from here to across the boundary almost to the Canadian shore is relatively pure, except as directly influenced by navigation."

Concerning the Niagara river the report says: "The first cross section of the upper Niagara river shows relatively pure water on the Canadian side and the beginning of noticeable pollution from Buffalo harbor. From the next cross section to the one below Squaw Island the pollution, though greatly increased in quantity on the United States side, is held to that shore. The pollution on the Canadian side, though of less extent, is likewise confined to its shore. This phenomenon is due to the immense volume and the great velocity of the river and the depth of the outlets of the Buffalo sewers. From this point the pollution tends to extend across the entire Tonawanda channel and from Rattlesnake Island to a point where it again joins the river the whole channel is shown to be grossly polluted. The use of this water as a public supply even with stringent purification is attended with considerable risk. The cross section below Buckhorn and Naval Islands showed undiminished pollution on the United States side. On the Canadian side the water, though less polluted, is still dangerous and should not be used without the most careful treatment; otherwise it is liable to give rise to periodical epidemics of intestinal diseases."

In the Gorge

"The results from the examination of samples collected in the gorge just below the two falls demonstrated that the pollution coming over was more uniformly distributed by the mixing. The pollution is still gross. Popular opinion is that the action of the falls tends to purify sewage. It simply mixes it more thoroughly with the water; it does not remove it nor its dangers.

"The river at Lewiston receives the water from the Great Gorge rapids and Niagara Falls. The mixing of the sewage received by the river from Lake Erie down with the river water

is likely the most complete possible. The samples examined show that from this point to the mouth of the river the water is uniformly polluted from shore to shore and that the use of water from this section of the river as a public water supply without the most careful and exacting purification should not be considered. The conditions are such that the drift may take place north, east or west, and with wind conditions favorable the pollution 10 miles from shore shows little diminution.

"The menace in this area is almost entirely directed at the present time toward navigation between Buffalo and Toronto. Further samples taken from the passenger boats along cross sections from Niagara-on-the-Lake and other lake points in this vicinity to Toronto corroborated the observation that this polluted area extended as far as 10 to 12 and even 16 miles on occasions."

H. B. Roelker, of 41 Maiden Lane, New York City, has built or is building Allen's dense air ice machines for the following named vessels: D. C. Jackling's new steel steam yacht Cyprus (designed by Cox & Stevens); the oil tank steamship Saxony, built at Camden, N. J.; United States torpedo-boat destroyers building at Camden, N. J.; oil tank steamships building at Camden, N. J., for the Guffey Refining Co. of New York; tender to submarine boats building by the Seattle Shipbuilding & Dry Dock Co.; Chinese steel training ship (gunboat) Fei Hung, building at a New Jersey shipyard, etc.

The Guffey Refining Co.'s tanker Oklahoma, built by the New York Ship Building Co. about four years ago, was wrecked in the great gale on the Atlantic seaboard in December while in ballast. A following sea mounted her aft, carrying away the smokestack and ventilators, smashing the skylight and flooding the engine room and stokehold. A short time later the Oklahoma broke in two just aft of the pilot house, which is a little forward amidships. The forward part was taken in tow by a passing steamer but sank before port could be reached.

The town of Ludington, Mich., is arranging for a celebration on July 3 and 4 in commemoration of the harbor improvements now under way. The celebration will be under the auspices of the Million Dollar Harbor club, of which W. L. Mercereau is president; A. A. Keiser, vice president; E. O. McLean, secretary, and F. W. Hawley, treasurer.

Lake Carriers' Association

*Its Great Progress in Recent Years is Well Indicated
in the Various Reports—Development of Welfare Work*

THE annual meeting of the Lake Carriers' Association was held in Detroit on Jan. 22 and was one of the best and most largely attended conventions ever held by the association.

The meeting also marked the return of the association to the Cadillac, and presented once more the stalwart and familiar figure of A. R. Rumsey on the marble staircase, who, as sergeant at arms, from this point of vantage, implored and entreated the members to assemble in the convention hall, and when entreaties proved futile followed them with threats of bodily violence. Surely when Rumsey goes we shall not look upon his like again.

President Livingstone presided. His annual report was, as usual, a comprehensive document, covering very completely the transactions of the association for the past year as well as commenting on the trend of business in general.

At the conclusion of President Livingstone's report J. H. Sheadle, vice president, discussed the welfare work of the association with which he has been closely identified during the past five years, and which has accomplished much in consolidating the interests of owners and masters. Mr. Sheadle made an earnest plea for the adoption of a uniform log which he believed should be consulted by the owner before the master is ever asked to explain any delay in dispatch. Mr. Sheadle said:

"It is now five years since the Lake Carriers' Association inaugurated the new plan of co-operation in the treatment of the human element in the transportation problems of the great lakes. The results obtained have far exceeded the most sanguine expectations, for never has there been, as a whole, such satisfactory relations between the men who officer and man the ships and the owners, as maintains at this time. While it is true there are here and there a few owners and here and there a few men who have failed to grasp the full meaning of the mutual advantages of

co-operative working, the percentage is small of those not in sympathy with the general development of this principle in our business and now manifesting itself in almost every branch of industrial effort. The employer and em-

ployee, the annual report of the president, and only general mention of some features of the work may be made at this time.

"During the year, with few exceptions, two meetings have been held each month by your committee, and the chairman desires to express his appreciation of the faithful and earnest work done by the members of the committee.

"The committee has had some problems to meet, for the enrollment of some nineteen thousand men brings a variety of items for consideration during a year. The system of registration, and the complete records kept of the men as they shipped on the boats, by the secretary of the association, proved of incalculable benefit at the time of the great storm in November, when so many lives were lost. Telegrams and letters poured into the Lake Carriers' office by the hundreds from anxious relatives and friends.

"The records were such that in most cases the office was able to either confirm the worst fears or relieve the inquirer by informing him the person in question was shipped on a vessel that was in safety. If no other good is ever accomplished by the system it has paid for all the effort it has cost by its efficiency at that time.

"An endorsement of the system, if there be need of endorsement, is found in the announcement by the merchant marine interests of Canada of their expectation of adopting some such plan as that of the Lake Carriers' Association.

"The marked increase in the efficiency of the shipping commissioners' staff is most gratifying. While there is much yet to be accomplished in this direction, the men filling these places are steadily growing in their comprehension of their duties, and are becoming more helpful each year in the general development. As time goes on they will continue to do better work.

"The general character of the men manning the ships is constantly growing better. An instance of this may be



PRESIDENT WILLIAM LIVINGSTONE
employed are each coming to a better understanding of their inter-relations, in that the ultimate success of one must come through the success of both. The statistics of the operations of the plan for the past year have been set forth in

noted in the annual report of the commissioner of one of the large ports. Of the 10,000 men passing through the office he states he found it necessary to ask but 37 men to leave the rooms because of intoxication, and but 12 for misbehavior—a percentage gratifyingly small. The splendid record made by the sailor in saving his money is worthy of note. The facilities for saving money, by using the plan provided on ship board for the transmission of money to the depository or to a man's family, has gotten many a man started on the road to thrift.

"This plan, started three years ago, resulted the first year in 514 men having accounts at the end of the season, 986 at the end of the second, and 1,145 at the close of last season.

"More and more owners have come to understand the steady effect of having thrifty men on board their boats. An analysis of the steadying influence of this saving habit shows that where there is a crew in which there is a large number of men having savings accounts in some bank, there it is also found that there are fewer changes in the crew list.

"The matter may be more concretely stated by referring to the secretary's report that in the case of a certain number of fleets employing 2,115 unlicensed men, there were 773 savings accounts, a percentage of 36.6 of the total number of men employed, with changes or shifting of 18 per cent, while in a certain number of other fleets employing 1,837 unlicensed men, there were but 109 savings accounts, or 5.9 per cent of the total, with crew changes of 25.1 per cent.

"The secretary further states that with few exceptions the changes in the personnel of the crews of all the boats, increased in the ratio that the number of savings accounts decreased. It seems therefore that in addition to the great benefit to the men, that it is well demonstrated that the saving habit has an economic value to the owner; which he cannot afford to miss by reason of indifference in furnishing the opportunity. A preliminary step has been taken in the line of educational work among the unlicensed men. A year ago one of our live commissioners of his own volition inaugurated a night school in the assembly rooms, doing the teaching himself.

"Encouraged by this start, and believing that there is a demand for this work, the welfare committee has arranged for night classes in Duluth, Detroit, Marine City, Cleveland, and Buffalo, as first experiments. Simple studies consisting of spelling, reading, writing, arithmetic, physiology, history and

mittee last winter. This committee of masters and engineers held a two days session, giving study to that most important subject, the prevention of personal injury on ship board. The committee did its work in a most intelligent manner as is shown in its report to the president of the association. The recommendations made were put in pamphlet form and placed in the hands of every man on ship board.

"A record of personal injury cases of the entire membership of the Lake Carriers' Association had never been kept prior to last year, but without exact figures for comparison, it is found by comparing the records of those fleets having such records for several years, that the number of personal injury cases materially decreased last year as compared with those of the years gone before.

"So beneficial have been the results it is certain that this committee will from time to time amplify the work so splendidly begun, for there is not only the great subject of prevention of personal injury, but there are questions of sanitation, the saving of money, and education. The slogan 'Safety First' is being sounded along the line in every industry in this and every other country.

"We are living in an age of conservation, and what is more important than the conservation of human life and limb? It is false economy to save a few hours time if by less hurry men can be saved from injury.

"It is true however that the majority of personal injury cases come not so much from a lack of physical safeguards, which the owners of ships as well as the managers of factories, mines and railroads, are providing in this latter day, as from heedlessness and carelessness on the part of the men themselves.

"Rules simply as rules are of but moderate value unless they are constantly discussed with the men by those in authority, teaching them as the manager of a great railroad has said: First, that rules mean something; second,

what they mean; third, that absolute compliance must be given to the rules and instructions. The recommendation of the industrial committee that each ship have a ship's committee, holding frequent meetings, was a long step in the right direction. The suggestion was adopted by a large number of own-



VICE PRESIDENT J. H. SHEADLE

civil government, have been arranged, with paid teachers obtained from the teaching force of the schools of the respective places. The results of this movement are looked forward to with much interest.

"Another instrument for good was the organization of the industrial com-

ers and the universal verdict has been that never before was there such co-operation among the crews as was noted last season. This co-operation made for safety, for if accidents are to be prevented both the chief officers of the ship and the men must work together for the welfare of all.

"It is not sufficient then to simply declare that a certain thing should not be done because it endangers others as well as the careless individual himself, but there must be constant effort on the part of the owners and officers of the ships to keep before the men all the time the thought that a little care and a momentary stop may mean the saving of a life. The National Council for Industrial Safety says in a circular issued in advance of the meeting, referring to a convention since held that it is hard to realize, based on statistics, that during the four days' session of the convention 22,272 workmen will have been killed or seriously injured, in this country. Statistics show that there are in the United States 30,000 non-fatal accidents each day from commonplace causes in all lines of industry. It is probably safe to say that forethought and care on the part of some one would have prevented 75 per cent of these accidents. Safety lies in little reforms. Each man on our ships, no matter how humble his position, may constitute himself a committee of one on safety. This habit can easily be established among the men if the owners will require the officers of his ships to systematically study the subject and then persistently insist on the men following out their suggestions and the rules of the industrial committee. As an instance of what may be accomplished in this direction may be noted in the statement of the Chicago & North Western railway, that last year they brought to the attention of their employes 4,382 different preventable accidents. To be sure most of them were small ones, but it must be remembered that it is the small preventable accidents that bring about the large majority of the accidents. It is not my purpose to here reiterate some of the things that should be done or should not be done in the way of minimizing personal injury in the operating of our ships, for it is the province of the industrial committee to supply the details, but I want to try and impress upon the owners that it is an obligated duty that they shall take every pains, through imperative orders and systematic reports, to see that every avenue for preventable accidents shall be closed."

Mr. Sheadle presented a tabulation of personal injuries aboard ship during 1913 which was the first year that any such record was kept and it is, of course, a question whether all the boats were faithful in reporting. The report says:

"However, there is a total of 325 slight, painful, and serious injuries reported from 171 different boats, or an average of about two per vessel; 211 were injured of the forward crews, 112 of the after crews, and 2 of outside labor. This total subdivided shows 215 injured through their own carelessness, 77 of which were slight injuries, and 138 painful or serious; 93 injuries which could have been avoided,

28 of which were slight, and 65 painful and serious. Seventeen were injured in an unavoidable way, six slight and eleven painful and serious. The greatest percentage of injuries occurred in the handling and working around machinery. If the men were more careful a great many of these injuries would be avoided. Sixty-seven per cent of the total of these injuries were due to carelessness on the part of the injured men themselves.

"In the handling of lines the next greatest number were injured. About 70 per cent were injured through their own carelessness and 30 per cent were injured through the fault of a co-worker. Among the kind of injuries received in this particular class were men getting their fingers pinched, getting their hands caught between cable and spile, not leaving go the line quick enough, and broken wires running into

their hands, also men at the winch taking up the slack before the line was properly put on the spile. Handling hatches is third on the list in number of injuries, 77 per cent being due to carelessness, 15 per cent which may have been avoided, and 6 per cent unavoidable. In the handling of steel hatches we find

that the men at the machine will start up the engine unexpectedly and the men around the hatches will get hurt in various ways.

There should be some warning given by the man at the

winch before the engine is started, so that those in the vicinity of the hatches can keep clear.

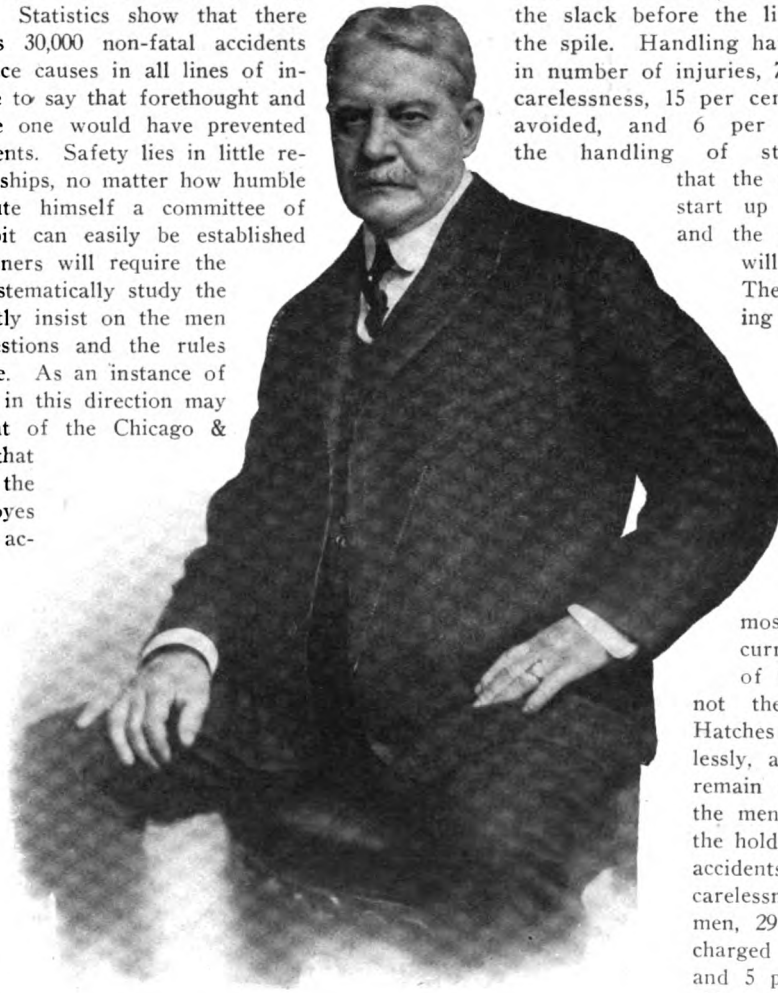
Injuries received by falling into the hold, handling hatches, and through other causes, are avoidable in most cases, that is to say,

most of these accidents occurred through the negligence of the men aboard ship, and not the injured man himself. Hatches are left uncovered needlessly, and things are allowed to remain around the deck, causing the men to stumble and fall into the hold. Of the total number of accidents 66 per cent are due to carelessness on the part of the men, 29 per cent which may be charged to avoidable accidents, and 5 per cent through unavoidable means."

There were thirty-five fatal accidents during the year of which

seventeen were held to be avoidable.

"My purpose in presenting these figures," said Mr. Sheadle, "is to emphasize, in a measure, the importance of this question. It is to be hoped that vessel managers the coming year will be particularly careful to obtain reports of personal injury accidents in the fullest detail, so that intelligent analysis can be made at the end of the season. A great many industrial works now have posted about their plants warning or reminding signs bearing on the subject of personal injury. Some boats have already adopted this plan to very good purpose. I have seen signs such as 'Safety First', 'Responsibility Rests With You', etc. I wish that the directors or executive committee might authorize the securing of such signs to be furnished at cost to the individual boats. Every owner I am sure is earnestly and seriously interested



HARVEY D. GOULDER,
General Counsel

in this question of safety of person on board their ships, and I believe they give general instructions to their officers in this direction, but there is a lack of persistent following up of the directions given and recommendations suggested, and they are not always carried out on their vessels.

"I think it is a well defined duty that every manager should keep this question before him at all times during the season to see that the measures which he has directed be done are carried out.

"The matter of sanitation is one that may well be given greater consideration. Not only does it apply to the care of food supplies on board the ship, but it applies to the sanitary manner in which these supplies are handled before they are placed on the ship.

"The matter of drinking water had already been given consideration, but there are other items, such as the refrigeration room on board the boat, the milk can, ice, etc. These should not only be looked after on board the boat, but I think we should go further and the attention of the dealer be called to the importance of sanitary methods of handling food supplies. I think a forward step would be taken if the Lake Carriers' Association were to appoint a Sanitation Commissioner—a man of practical sense and knowledge, whose business it would be to board the boats and visit the dealers who furnish the supplies for the boats, in the interests of this subject. Further in regard to educational matters. I hope to see the day come when one of the new officers of the Lake Carriers' Association will be a Commissioner of Education. The brief experience we have had thus far with the night schools established, shows that there is not only a need, but a desire on the part of many men for aid in this direction.

"The matter of intemperance is one of practical consideration, let alone any reference to the morals of the question. While intemperance happily is decreasing among the sailor men as they have improved in general character, there is still need of further consideration of the matter.

"While it seems almost foreign to the subject, I feel that the adoption of a somewhat uniform Ship's Log by every vessel, would contribute to further safety on board the ship. A complete day's log not only records the story of that day's navigation, but also furnishes an opportunity for the recording of specific duties performed in line with provisions in effect on that ship for the prevention of accident. I wish such law might be adopted by all."

The convention was very largely given over to a consideration of the reports of the committee of masters on

aids to navigation, the committee of fleet engineers and of the industrial committee made up of captains and engineers. These reports are very voluminous, especially that of the committee on aids to navigation, and it was practically impossible to consider its various features in detail and pass upon them intelligently in the time allotted. At Mr. Coulby's suggestion they were ordered printed and will be taken up in detail later by the board of directors.

The association, however, endorsed the recommendation of the committee that a new survey be made of the lower end of Lake Huron, as well as of the Nine Fathom bank, as a result of the great November storm. Eight staunch vessels foundered in this general location in the storm.

The establishment of a central weather bureau on the lakes was also held to be necessary and that the forecaster should be permitted to issue warnings independent of Washington. At present everything

must be sent to Washington before it is liberated, frequently causing vexatious delay. It was also recommended that storm signals be hoisted at all lake stations, for all expected winds having a velocity of over 35 miles and up to 50 miles an hour. When the velocity of the wind is expected to exceed 50 miles an hour, then the hurricane signals should be hoisted. The direction of the expected wind should be hoisted in conjunction with the storm flag.

The Coston distress signals will hereafter be used on all Lake Carriers' vessels.

The report of the fleet engineers was presented by F. B. Smith. He condemned the present method of interior inspection of boilers in the spring or summer by the steamboat inspection service as it makes for delay in fitting out or operating the boats. The com-

mittee believes there is no reason why the interior inspection may not be made in the fall after the boat is laid up.

Mr. Smith also urged that young men should spend more time as assistant engineers in order that they may be thoroughly competent when placed in charge of the machinery. There is a bill now before congress which requires second assistant engineers to be carried and the development of the third engineer presents quite a problem. The supervising inspectors of steamboats are now in session in Washington and they propose to adopt a regulation putting the boilers on all steamers on the tank top. Mr. Archie Thompson asked Mr. Smith what was the advantage of this and Mr. Smith replied that he did not know, but thought possibly the ship might



SECRETARY GEORGE A. MARR

not roll quite as deep. Mr. Smith suggested that a committee of engineers be named to meet with the supervising inspectors and he was instructed to arrange for the appointment of such a committee.

A resolution was offered by C. M. Heald, protesting against the establishment of any industry on Coit Slip in Buffalo harbor, owing to the great inconvenience which it would cause to vessels. It was unanimously adopted. The resolution was inspired by the proposition recently advanced to transfer the Lackawanna trestle to Coit Slip. It was also recommended that the channel entrance at Buffalo be widened from 198 ft. to 400 ft.

The widening of the Livingstone channel from 300 to 450 ft. was also urged.

During the temporary absence of Mr. Sheadle from the room, C. M. Heald, of Buffalo, took occasion to pay a tribute to him for his unobtrusive, but increasing and thoroughly competent work on behalf of the men aboard ship saying:

"I notice that one of the most effective hard working men connected with the Lake Carriers' Association has absented himself from the room.

"I therefore ask you, gentlemen, because of the splendid work done in the quiet, but very effective manner and which you will soon realize through its results, that is, the work done by the vice president, the head of our welfare plan committee, who has embodied in his work plans which in their results will bring the greatest benefit to this association and to every officer manning our ships; I therefore ask you, as the gentleman has now returned to the room, being absent when the vote was cast, to show your appreciation of him by rising to your feet."

Harvey D. Goulder, general counsel for the association, spoke of the La Follette seamen's bill and the manner in which it affects lake craft. A brief has been prepared on the subject which will be generally distributed by the Lake Carriers' Association. Harry Coulby gave voice to a few reflections on the line of moral responsibility which have occurred to him since the great November storm, and as there has been some discussion as to exactly what he said his remarks are printed verbatim elsewhere in this issue.

The following members, representing the younger element, were added to the board of directors: George M. Steinbrenner, R. D. Mitchell, Roy A. Williams, J. Burton Ayres, A. C. Sullivan, Capt. W. G. Stewart, John T. Kelly, Wm. P. Snyder Jr., W. M. Williams, A. E. R. Schneider and C. C. Canfield. The old members of the board re-elected are: J. H. Sheadle, H. Coulby, John Mitchell, H. D. Goulder, W. C. Richardson, J. S. Ashley, W. H. Becker, W. A. Hawgood, Walton H. McGean, A.

F. Harvey, A. T. Kinney, Wm. Livingstone, D. Sullivan, Charles M. Heald, W. E. Lloyd, J. J. Boland, G. A. Tomlinson, Howard L. Shaw, S. P. Cranage, H. S. Wilkinson, John Craig, W. F. Mills, C. D. Dyer, W. H. Smith, H. K. Oakes, A. W. Thompson, J. B. Rodgers and L. C. Waldo.

All of the old officers were re-elected as follows: President, William Livingstone; vice president, J. H. Sheadle; counsel, Harvey D. Goulder; treasurer, Captain George P. McKay; secretary, George A. Marr; shipping commissioner, A. R. Rumsey. The executive committee was elected as follows: J. H. Sheadle, H. Coulby, J. S. Ashley, John Mitchell, Charles M. Heald, D. Sullivan and G. A. Tomlinson. John

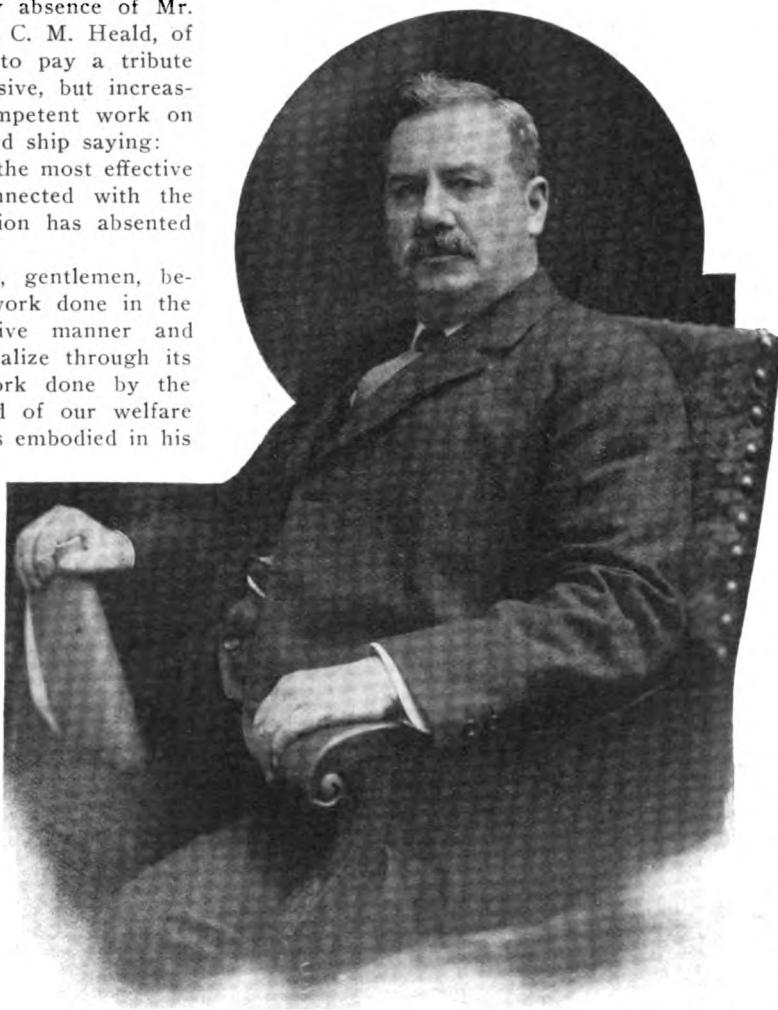
T. Kelly, of Cleveland, was elected alternate of the executive committee in place of J. S. Ashley. The convention closed with the annual dinner, which was a very happy affair and which was presided over by President Livingstone. The chief speaker of the evening was Senator Chas.

E. Townsend, of Michigan, who made a very illuminating address on an ocean waterway from Duluth to Montreal. He was followed by Gen. W. H. Bixby, formerly chief of engineers, War Department, and Col. William P. Anderson, chief engineer of the Department of Marine and Fisheries, Dominion government.

Touching for a moment on the welfare work, there is noted a marked increase in the number of registrations. The total registration in 1912 was 18,194. During 1913 it was 19,553, classified as follows: Masters, 437; chief engineers, 490; mates and second mates, 937; assistant engineers, 622; able seamen, 7,633; ordinary seamen, 9,434; total, 19,553.

It is believed that the number for 1913 is perhaps the normal registration for a year in which all the vessels of the association are in operation, and it is therefore to be expected that there will be little, if any, increase beyond this number in the future until the number of vessels is materially increased.

The work of enrollment has been free from incident, the men appearing more ready to accept its advantages and to take the initiative in applying for registration and renewal. The co-operation of the officers of the vessels in promoting the registrations has been general. It will always be necessary for the success of the movement and the availing of its advantages to the fullest extent on the part of the men, that the owners and officers continue to give the movement their moral and active support and to see that the men in their service under-



CAPT. D. SULLIVAN,
Member Executive Committee

stand the benefits that accrue to enrollment.

The club room privileges have been as extensively accepted as in previous years, and marked improvement has been made in the advantages offered by these rooms. New and larger rooms have been provided at Ashtabula and a shower bath has been installed, which was impossible in the rooms formerly occupied at this port. The seamen's rooms at Detroit have been enlarged; improvements, including a shower bath, have been installed at South Chicago and more commodious quarters are being sought in other ports.

In the officers' club rooms pianos have been installed, and the Victrola records have been added to materially, the selections being for the most part music of classical character and by artists of recognized merit.

In all rooms the subscriptions to the current magazines and periodicals have been liberal and the men have availed themselves to a greater extent in the reading of them.

Welfare Work

A pool tournament was arranged last season between teams of the Engineers' Assembly Rooms and the Shipmasters' Lodge in Cleveland. Much enthusiasm and good feeling resulted and plans have been made for a more extended tournament during the present winter, to be participated in by representatives of all of the Officers' Assembly Rooms maintained under the welfare plan.

If the welfare plan needed any vindication, its purposes were amply justified by the service it rendered in accounting for the men whose lives were lost in the great storm of Nov. 9, and in responding promptly with reliable information to the hundreds of inquiries concerning men employed on vessels of the association, other than those wrecked. In the calamity which visited the Great Lakes on that date, six vessels of our membership were lost with their entire crews. By our system of registration the name and address of practically every member of the crew of each vessel was on file in our office, together with the name and address of a near relative or friend of each man. With this information at hand almost every body that was recovered from the wrecks was identified and delivered into the hands of relatives or friends, who were thus enabled to perform the last service that can be rendered for any person.

In addition to this, the death benefits provided by the Lake Carriers' Association furnished funds so necessary at such times and when, in most cases, money was not otherwise available.

Sad and horrifying as the loss of life was on this occasion, the death benefits, which were paid as promptly as possible, were of much practical help in time of need and saved so much of distress that comment is unnecessary.

The total amount paid in death benefits during the year was \$18,245.60. This is \$15,949.60 in excess of those paid in 1912. The number of payments for 1913 was 123, as compared with 21 in 1912. Obviously the large increase was due to the November disasters, when 153 lives were lost from vessels in our association, of



A. R. RUMSEY,
Chief Shipping Commissioner

which number 132 were members of the welfare plan, with a total of \$17,825 for death benefits.

Of the 132 death benefits payable as a result of the storm of Nov. 9, 36 payments, aggregating \$2,900, are still to be made, delay in which is due to faulty addresses of the beneficiaries or their residence in foreign countries. Efforts are being made to get into communication with all of these and as quickly as they can be reached these benefits will be paid.

In addition to this, the machinery of the association has been placed at the disposal of the committee having

charge of the distribution of the relief funds accumulated for the assistance of the families of the victims of the storm. Without the system of records, which we maintain, the work of this committee would have been greatly hampered and could be but imperfectly and incompletely performed, if, indeed, it could have been undertaken at all.

Four-Mile Waves

According to Prof. J. A. Fleming, several of the most powerful wireless stations are now generating ether waves having a length from crest to crest of about four miles, and these disturbances can be "detected" at distances up to 6,000 miles from their source. That is, four such stations would suffice to "girdle" the earth. Obviously, however, the ability to "detect" the signals over this vast distance, presumably under favorable weather conditions, is a very different thing from the power to maintain commercial communication along the route. As yet the wireless service available to the public covers but a third, or at most, half, this distance.

There is as yet no means of determining the practical limit of wireless communication. Improvements in apparatus, perhaps even some new discovery as to methods of stirring up the ether, may revolutionize the art and upset all present standards. But at present even the most successful systems get into serious difficulties when called upon to maintain constant communication over a line 2,000 miles in length. A recent British wireless commission was able to secure but one demonstration on a line 1,000 miles long, although several companies declared their ability much to exceed this distance in a commercial installation.

The Royal Mail steamer *Cobequid* stranded on Trinity ledge, Bay of Fundy, Jan. 15, becoming a total loss. The crew and passengers were rescued by the steamers *Westport III* and *John L. Cann*, who responded to the calls of wireless, though owing to heavy weather and a blinding gale it was three days before all the crew were taken off.

The Old Dominion Line steamer *Monroe* was sunk in collision with the steamer *Nantucket*, of the Merchants and Miners' Transportation Co.'s fleet in a dense fog about 24 miles southwest of Winter's quarters shoal light vessel at 1:30 a. m., Jan. 30, while en route from Boston to Norfolk. Forty-one lives were lost.

Individual Responsibility

Its Importance All Along the Line from the Association to the Owner and to the Individual Master is Very Clearly Pointed Out by Mr. Coulby

AT THE annual meeting of the Lake Carriers' Association, in Detroit, Harry Coulby, president and general manager of the Pittsburgh Steamship Co., indulged in a few reflections which created a profound impression, and as a matter of record, are given herewith in full:

"I want to claim the attention and intelligence of the members for a few moments," said Mr. Coulby, "to a few things that have been running through my mind, coming out of the late November storm and its attendant loss of life that not only the vessel owners, but everyone else so keenly feel.

"In 1903, the Lake Carriers' Association had practically outgrown its old clothes, and it was found necessary to incorporate, and as you know the reasons given for incorporation of the Lake Carriers' Association was set forth in Article 3 of our by-laws, which goes on to say:

"To establish and maintain by contract or otherwise such amicable relations between employers and employed as will avoid the public injury that would result from lockouts or strikes in the lake carrying service; to provide for the prompt amicable adjustment of matters affecting shipping and the interests of vessel owners on the Great Lakes, their connecting and tributary waters."

"It might be well to see what account we can give of our stewardship in carrying out our purposes for incorporation. About 11 years have elapsed and I think everyone will agree that the progress made by the association has been wonderful. You have heard read this morning the report of our president, the report of the welfare plan committee, and also reports from the industrial and several other committees, and tomorrow we shall have the report of what I call the foster child of the Lake Carriers' Association — the Great Lakes Protective Association — that primarily took up as its work the elimination of accidents on the Great Lakes.

"It seems to me that this association was one of the first incorporated bodies of men that read aright the signs of the time—that is to create a better feeling between the employer and employed, so as to better serve the public. Some of the things that were started were questioned and criticised, and today it is not uncommon to hear some criticism of our welfare plan. Once in a while we hear where an employer or employee is not in sympathy with our savings plan, and so on. I presume if it were known that when the

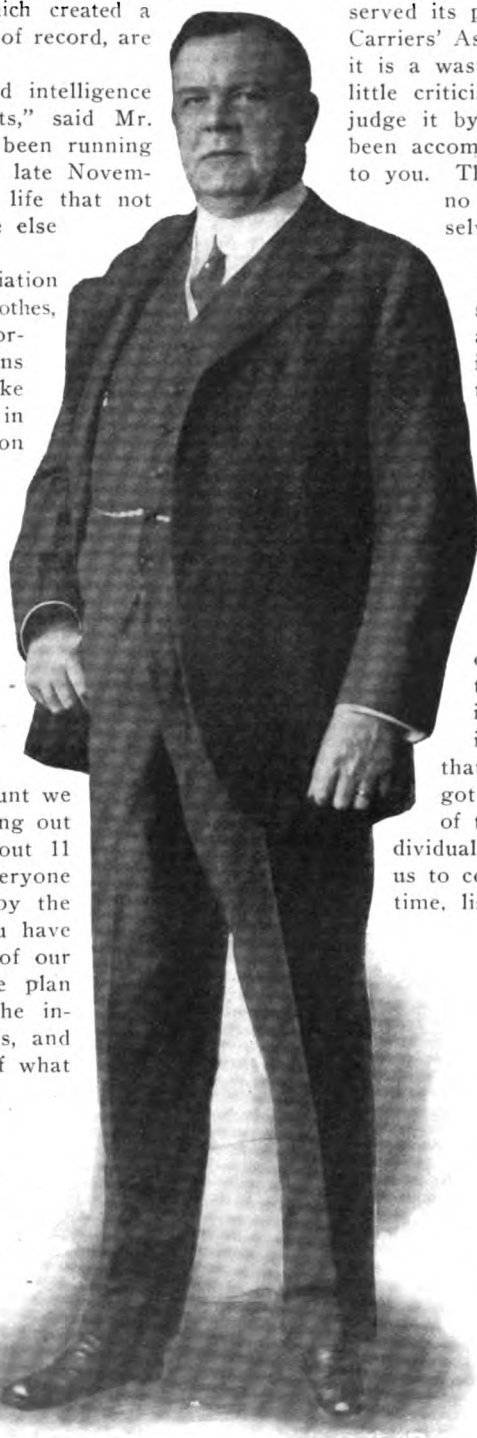
ark was being built some of the fellows that were saved in the flood severely criticised the construction of the ark. However, it seems, in reading history, that it served its purpose. In going over what the Lake Carriers' Association has done it seems to me that it is a waste of time to take up and discuss any little criticism there may be of detail, but rather judge it by the sum total of the result that has been accomplished. These results have been read to you. The welfare plan and savings plan need no commendation, they speak for themselves. So much for the past.

"Has the Lake Carriers' Association done all that it can do? I don't think so. I think it will have to keep taking advantage of the flood; if it does not, it will get caught in the ebb. Associations are no different from individuals.

They must keep growing. When we take up the president's annual report and when we get back towards the end of that report, we keep seeing that deep black line, illustrating that we are continually changing watch. Some of the old watch are passing over—their watch is done, new men are being recruited to carry on the work. It seems to me that in thinking the matter over and in pondering over the things that developed during the storm of Nov. 9, and the talk that grew out of that storm, that we have got to more and more realize as members of this Lake Carriers' Association, our individual responsibility. It is all very well for us to come here once a year and have a good time, listen to very able reports, frame up a

bundle of resolutions, pay no more attention to it until the next meeting, and then in a measure repeat the same formula. Resolutions, gentlemen, to be effective must mean something. They are the expression of what we believe should be done to benefit the service, to benefit the most men, and where we just pass a resolution and then rest on our oars, it is simply like pulling up the anchor and not starting the engine, and it has seemed to me that the Lake Carriers' Association, and the individual members of the association, and the general public must begin to realize the individual responsibility that rests upon them, and we shall have to provide some means in which, when the association passes resolutions that certain

things should be done, some means or some method must be devised that will enforce the carrying out of these resolutions. At times the members of this association have been placed in the rather unfortunate position of having to explain, or attempting to



HARRY COULBY,

President and General Manager, Pittsburgh Steamship Co.

explain why certain principles of the Association were not being carried out by some of its members. It is a pretty hard thing to do. That same condition has confronted us at times when we have gone to Washington.

"I believe that the appointment of these committees from the chief engineers and from the masters is one of the best things that has ever been done by the Association, and I believe their recommendations should receive very careful consideration from the directors of the association, that ample and full opportunity should be given to all of the members to express their views, but I do believe when any action is taken by the association upon any of the recommendations by a very large majority, that that majority should not allow a small minority of its members to defeat the purposes of the association. In fact, I believe in the saying, 'If thy right hand offend thee, cut it off.'

Divorce Ourselves

"If we have any minority members who are not holding up to what we believe is best for the association, the time has come when to save ourselves, we should divorce ourselves from such minority, if, after they have been given ample opportunity to come in and join with us in the work, they have decided they would rather not. The question of dues, the question of showing a large tonnage is immaterial, gentlemen, as compared with showing we are all keeping step, and stepping forward. The greatest benefit that we can possibly give to this association and to the public, is this question of individual responsibility, and I want to see that carried out, or suggest to this association the advisability of carrying it beyond the vessel owner, giving him the individual responsibility that rests upon him, then carrying it down a little bit farther to the master and to the chief engineer, and the men in authority on the ships, and making each man realize his individual responsibility.

"Let us see what that means. The responsibility to which I refer is, first, that any vessel owner after a statute has been written on the books, while that statute is being discussed he may have seriously objected to it, he may think it is not a good statute, but when it becomes a law it is our duty to see that it is carried out on the ship. I do not know, no man knows what laws will be passed with reference to operation of steamships. I do believe, however, that we shall have full opportunity to be heard before the laws are passed, and I have an abiding faith that if our case is good and our objections are good and valid,

not simply from a commercial standpoint, not simply from the standpoint that we cannot afford them, but if it is unnecessary and not practical, we will be able to demonstrate to the men who legislate that it is not for the best interest of the public. After a law is passed, then, as citizens, it is our duty to live up to it.

"On this question of individual responsibility it even goes down to what Mr. Sheadle has said today with reference to sanitation. It takes in all of these things that are contained in this report of the industrial committee about life lines, and putting everything on our ships that ought to be on them for the full protection, as far as possible, of life. That is a duty which we owe, we cannot get away from it. When we take and send our ships out, ask men to go out on them, it is our duty to do everything that can be required of us to make the vessel seaworthy and provide such appliances as are necessary for safety of life. These things on the ships properly taken care of, the men properly warned of dangerous places—that in my judgment is the individual responsibility that rests upon the captain and chief engineer. He should be made to thoroughly understand that that is just as much a part of his duty as the safe navigation, and we should hold him accountable, and if through negligence or carelessness on the part of the master or officer in authority, if through carelessness there is personal injury or loss of life, it will be charged against him in the judgment of the manager, the same as though through carelessness he damaged the bottom of his ship.

Safety of the Ship

"In order to do that we should have some means devised for looking after it, have it reported to this association as a body what is being done along that line, what is being done by our members along similar lines. The thought that is running through my mind is this, if we have any member that does not care anything at all about safety appliances, will not be bothered with anything along the lines of safety on his ships, where an accident on his ships through gross carelessness means reflection on the whole body, there should be some method for allowing that man to do as he likes, but not under the wing of the Lake Carriers' Association.

"We have worked out a committee of chief engineers to take up and bring before this body all important matters affecting the men on the ship in their department, and last year we started at the other end with the captains, with a captain's aids to naviga-

tion and industrial committee. As I read over their reports hastily as I have done, I was very much impressed with the forward movement amongst these men. There are a few things in their reports that received the unanimous recommendation of that committee, some of which, when they were first inaugurated several years ago, you could not get anyone to endorse it. It means we have got them thinking, we have got them studying out these propositions. We have the men thinking for themselves. It is working amongst our lake men as everywhere else. They are doing good work.

Individual Responsibility

"It does seem to me that there ought to be a committee of captains who should bring to the attention of the Lake Carriers' Association not only matters of aids to navigation, matters of safety, but matters of the well being on their ships. It should be a committee that by reason of its close relationship among the masters on the lakes, should be an avenue of reaching the Lake Carriers' Association and bringing up all matters that properly should come to us, and in my judgment which the association is responsible for to the public. That may seem to you, gentlemen, a little bit radical, it may seem that I am advocating something that may cause trouble. I am not speaking of a new thing. I have tried this plan out for years, and I am very glad to stand here before the owners, and a good many masters, and say that from a committee of masters that I have had working for years I have gotten more practical benefit, more good, sound, hardheaded advice upon practical things on board the ship, than from any committee or any body of men I have ever met, and I think I would rather lose all my shore committees than that committee, so far as that department of the work is concerned. I believe, gentlemen, that before we leave, instead of having a number of committees with not very much responsibility, that this association, through its board of directors, should appoint a committee of masters, taking them from men of long standing who by reason of the faithfulness have attained a position in the first ranks, and have that committee consider and bring such matters before this executive committee as may occur to them. I am not ready to make a suggestion as to how this committee should be made up, that is a matter of detail, which can very easily be worked out.

"The question that appeals to my mind more than anything else is this question of safety. That in my judg-

ment is pretty nearly absolutely up to the officers of the ship. There is going on in this country today a great agitation with reference to safety of employes. A good many of you know the states are passing compulsory compensation laws. We should not go at it in a haphazard way. If that committee is appointed, as I suggest, if they make recommendations for safety appliances on the ships and they have been discussed by the board of directors and have the approval of the association, then I think the Lake Carriers' Association should see to it on every ship in the association that they carry out the purposes of the association with reference to safety."

Sketch of Octavius Narbeth

Octavius Narbeth, who has during his past two years represented Lloyds Register, at Cleveland, has been transferred to Philadelphia. During his stay on the lakes, Mr. Narbeth won the esteem and respect of all with whom he came in contact. Mr. Narbeth began his career as shipwright apprentice in Pembroke dock yard, in



OCTAVIUS NARBETH

1883, where he received a most thorough training. At the completion of his apprenticeship, in 1892, he was transferred to the Chatham yard. Upon the completion of his examinations, in 1895, he was appointed as admiralty overseer of battleships building by contract at the Navy Construction & Armament Co.'s yard, Barrow-in-Furness. In 1898 he accepted a position as Lloyds surveyor at Middlesborough in Yorkshire, being transferred in 1905 to Hartlepool. He was appointed

senior surveyor in charge of the Great Lakes in 1912. He is succeeded at Cleveland by Evan Edwards.

Address of Harvey D. Goulder

At the annual dinner of the Chamber of Commerce, Buffalo, at the Hotel Statler, on Jan. 7, Harvey D. Goulder, general counsel for the Lake Carriers' Association, was the principal speaker. In his address Mr. Goulder traced the history of lake trade from the time of the Griffon, noting each step until the construction of the canal at Sault Ste. Marie, which marked the real beginning of lake trade, and then carrying the subject down to today.

He also traced the growth of vessels and showed that in point of actual freight shipped, Duluth-Superior is the greatest port in the world, though its commerce is confined to a period of eight months in the year. Buffalo he held to be second. Coincident with the growth of the ship he traced the development of dock machinery for handling the bulk freight trade. In his conclusion he devoted attention to the great November storm, relating a talk he had with an experienced master who was out in it.

"The wind was blowing seventy to eighty miles an hour," said Mr. Goulder. "The seas were the greatest that the master had ever seen in a life experience on the lakes. He had his great ship in the most perfect trim. A short distance ahead of him was another ship. He was barely able to hold his ship head to, expecting any moment to be blown around into the trough of the sea. He saw the ship ahead blown around in that manner, the seas washing over her so that at times they could only see the pilot house and the smokestack. And when she was blown around he remarked to his mate, 'That ship is doomed, and I am afraid it will be our turn next,' and then the snow set in so thick that they saw no more of the ship.

"I asked the captain what he endeavored to do, and what he could have done for their assistance and he said that there was absolutely nothing. They could not get to her nor could they launch a boat. 'Within half an hour,' he added, 'we blew around.' He could not bring his ship head to. He finally managed to have her go off before it, went down some miles, then attempted to bring her around. He let go one anchor and eased the chain to prevent shock and breakage; then he let go of the other anchor, working his engine full speed

ahead and finally got her head to with the waves making a clean sweep over his ship, and then both chains snapped, but he had succeeded in getting her head to and kept her so. There was some shift of wind which aided, and in the morning, unable to see on account of the snow, the mate sounding with the deep sea lead, the captain saw over the side roily and muddy water. The mate reported 22 fathoms—132 ft. of water. The captain told the mate he could not believe this possible because never in his experience had he ever seen anything but pure limpid water in that place; nor could he believe that the storm could stir up a bottom at such a depth. They repeated their soundings until certain that they were in 22 fathoms."

Mr. Goulder stated that both owners and masters are endeavoring to ascertain whether any possible improvement in construction or equipment will make for better safety, although it is hoped that no such storm will come again as will stir up the bottom of a great lake at a depth of 132 ft.

Seattle Construction and Dry Dock Co.

The Seattle Construction & Dry Dock Co., Seattle, Wash., has put out a very elaborate folder concerning its equipment. The development of this plant since it was taken over from Moran Bros. has been very rapid. It has been developed into the largest shipbuilding and repair plant on the Pacific coast, covering 27 acres, and is served directly by five trunk railroads. The plant now consists of a 12,000-ton floating dock, a 3,000-ton floating dock, and is now adding an 8,000-ton dry dock as well. Deep draught obtains right up to the company's plant, enabling even large sailing ships to reach it unaided. It is completely equipped with pattern shop, joiner shop, foundry, machine shop, boiler shop, blacksmith and forge shop, bolt shop, pipe shop, galvanizing shop, saw mills, shear legs and various cranes.

The new 12,000-ton floating dry dock was finished during 1913. It is the intention of the company to immediately increase it to 18,000 tons lifting capacity, and it will then be capable of docking practically any vessel on the Pacific. The company is prepared to give immediate dispatch to all vessels visiting the port. This yard is thoroughly equipped to build or repair anything from a battleship to a tug, and its business will undoubtedly be greatly stimulated when the Panama canal is opened to commerce.

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February, 1914

Panama Canal and Shipbuilding

It is understood that the cruiser Denver has been selected to officially open the Panama canal some time in March. Sweepings through the Culebra Cut indicate a draught of 30 ft., which, of course, is ample for all but the very largest class of merchant vessels plying in the North Atlantic trade, and which are not likely to be diverted to Panama for many years to come. Jealous guardians of our merchant marine, and we wish there were more of them in the land, have been inclined to take exception to certain remarks in our January shipbuilding review regarding the influence of the canal upon shipbuilding in the United States. It was certainly not intended to withhold credit where credit is due, nor was it intended to minimize the loyal efforts that have been made by steamship interests to construct fleets of vessels for this waterway. It was, however, regretted that in this continent covering country, containing ninety millions of people, being virtually the constructive force of a whole hemisphere, that not more was being accomplished.

It is quite true that the American-Hawaiian Steamship Co. have built during the past two years eight splendid steamships, six of which are already in commission. It is true that W. R. Grace & Co., of New York, have built four new steamers, all of them in commission. It is true that the Emory Steamship Co., of Boston is building two at the Fore River yard, that Cramp's are building two for an interest as yet unannounced, that the Great Lakes have also contributed their quota, and that the construction of all these

vessels has been inspired by the creation of the Panama canal. The coastwise lines have undoubtedly added to their equipment, but it is nevertheless to be regretted that more has not been done.

This country has spent over \$400,000,000 to bring the Atlantic and Pacific seaboards closer together and to open up new markets by shortening routes. We hope the time will come when not twenty, but two hundred ships will be built for Panama canal service, and they would be built, too, if the public conscience could be awakened to the necessity of extending help to our merchant marine. Nothing will ever be done by congress until the necessity for action is brought home to the people. It is surprising that the people remain inert in the face of a situation that is fraught with the utmost danger. The trouble is that inland interests cannot conceive the ship to be an integral part of their business, yet it is a necessary and important one and the time will come when the whole nation will realize it. When that time comes, we will have ships in plenty.

The Great November Storm

Owing to the great interest aroused over the November storm on the Great Lakes, THE MARINE REVIEW has decided to reprint in its supplement in the March issue, the account of the storm as contained in the December issue with numerous additional illustrations and particulars. The December issue is totally exhausted. An effort will be made to make the supplement a very complete history of the storm, one that will doubtless be preserved and called for for many years to come. In all probability it will be many years before a storm of such a character visits the lake region again. Certainly no such storm has occurred before since the lakes were commercially navigated.

Panama Canal Tolls

It now seems that President Wilson thinks that vessels engaged in coastwise service should pay tolls in passing through the Panama canal. It does appear as though whenever a favorable opportunity arises to help the American ship some one is sure to find a stuffed club handy somewhere. Let us for a moment grant the force of the contention that American ships in foreign trade which meet the open competition of the world, should pay the tax the same as the ships of all other nations; but what has that got to do with our domestic shipping?

As far as our domestic trade is concerned, the Panama canal is but an arm of our artificial waterways. It is merely the extension of a dredged area through which our domestic shipping may go from one American port to another American port. An American ship can carry a cargo from New York to Charlestown, Galveston or New Orleans and pass through many a channel which has been improved by

American money without paying tolls. Why then may it not carry a cargo from New York to San Francisco or Seattle or San Diego without paying tolls? In none of these services can the foreign ship engage. The port to port trade of the United States has been reserved to vessels of American register since the beginning of the government and millions upon millions have been expended to make the harbors accessible to them. No foreign ship has ever carried a cargo between any of these ports and therefore is not in competition. If an American ship passes through the Panama canal in coastwise trade without paying tolls it will not put foreign ships at a disadvantage, because they cannot engage in the trade anyway.

Lake Carriers' Association

It is probably true that no organization of employers anywhere in the world is endeavoring to work out the problems of management with a finer regard for mutual rights than the Lake Carriers' Association. During the recent meeting in Detroit not even so much as mention was made of the commercial end of the business, but the whole time was devoted to the human element. The questions considered were those of personal injury, of education and of sanitation—things that make for saner, safer and better living. Practically since it became an incorporated body, notably so for the last five years, the Association has pursued a campaign of enlightened intelligence to the end that the personnel of the lake fleet might be improved. It is only necessary to look backwards to note how marked the improvement has been. No association has done more to demonstrate the fact that the interests of employer and employed are common. In this it has read aright the signs of the times.

Impure Lake Water

Dr. Allan J. McLaughlin has just submitted to the International Joint Commission a report on the water supply of the Great Lakes, which should be procured by every vessel owner and copies furnished to all masters. It is a highly important document on health. Dr. McLaughlin and his associates made tests of the water from Duluth to the outlet of Lake Ontario into the River St. Lawrence and their discoveries are certainly astonishing. One would naturally suppose that the water of St. Mary's river would be among the purest on earth, and it is very astounding to learn, therefore, that it is grossly polluted and unsafe for consumption. The waters of Detroit river from Fighting Island to its mouth and out into Lake Erie practically to the islands are condemned as not only unfit for domestic consumption, but cannot be made safe in a raw state by any known means of purification. In fact, the report states that there is no point from the foot of Lake Huron to the islands in Lake Erie from which vessels may safely draw their water

supply. The report has great value in indicating those portions of the lakes in which the water remains in its pristine purity. Lake Superior water in general is pure except for local pollution, and the waters on Lake Erie at various points, and especially at Buffalo, within a reasonable distance out from the breakwater to practically the boundary line are pure. A dangerous situation is indicated to exist at Lewiston, where the Niagara river enters Lake Ontario, thoroughly mixed with sewage, which the winds have been demonstrated to carry from ten to sixteen miles out into the lake.

The La Follette Seamen's Bill

While there is little probability of the La Follette seamen's bill, inspired by Andrew Furuseth, president of the International Seamen's Union, passing the house, yet an unflagging alertness is necessary to prevent any mischief being accomplished. This bill is absolutely one of the most pernicious measures ever introduced in congress and is very cunningly devised to put the entire control of the crews into the hands of the union. Among the provisions of the bill is one that desertion is proper and that a seaman in any port can demand half the wages due and leave his ship, regardless of his obligations under the shipping articles. Under this provision any liner could be put out of business, because the entire crew could demand half their wages and leave the ship and there would be no authority under law to compel them to return. The thing that would happen would be that the Seamen's Union would dictate with the steamship companies for reshipping the crew at higher wages. Moreover, under this provision how easy it would be for an undesirable alien who would not be admitted to the country as a paying passenger to enter as a deserting seaman.

The defeat of the bill is of vital importance not alone to American shipping, but to the shipping of all nations. Under the provisions of this bill the Emperor, which now operates with a crew of 885 men, would have to increase the number to 1,275. The provision that each life boat should be equipped with two able bodied seamen would put every passenger steamship line in the United States out of business. The conditions of inland water navigation are frequently such that life boats are not necessary. It would be far safer proceeding in numerous instances to beach the vessel rather than to waste time in launching life boats. Moreover, the superstructure of a great many of the vessels plying on inland waters is such that it could not sustain the weight of these life boats and davits.

The pernicious feature of this bill, however, is that it makes it absolutely to the interest of the officers of the Seamen's Union to persuade foreign seamen to leave their ships in American ports and go to the various boarding houses that are conducted under the auspices of the Seamen's Union, where they would be practically at the mercy of the union and where their boarding house debts and union dues would be collected before they are reshipped.

Senator La Follette says that Furuseth spent every Sunday morning with him for a period of four years teaching him the law of the sea. It is surprising that in four years' time it did not dawn upon La Follette that the teaching was of a very specious character. It is high time that the public understood Furuseth and his methods.

Great Lakes Protective Association

What the Association Has Accomplished Under the Progressive Leadership of J. S. Ashley

THE annual meeting of the Great Lakes Protective Association was held in Detroit on Jan. 23, and was presided over by J. S. Ashley, chairman of the advisory committee and the virtual founder of the association. The advisory committee in its report stated that up to Nov. 1 there was every indication that the year would prove even more profitable to the underwriters than 1912. Carefully compiled estimates indicated a probable profit to the association of approximately 50 per cent in spite of the fact that the initial contribution had been reduced nearly $\frac{3}{4}$ of 1 per cent below that of 1912. Nov. 9, however, was destined to be a memorable date in the history of lake navigation. A storm of unprecedented violence struck the whole lake region, but centered its fury in the foot of Lake Huron, causing eight staunch and modern ships to founder in that locality. Altogether, 18 vessels foundered, 235 lives were snuffed out and scores of vessels were damaged. Six of the 18 vessels totally lost and eight of the 20 damaged ships were enrolled in the association. The initial contribution was not sufficient to pay the losses and a special assessment of 50 per cent of the original contribution was necessary. It was promptly paid. "Your committee," says the report, "is getting reports from the masters and other licensed officers of all ships which were out in the storm with the hope that something of value may be ascertained in order that all necessary precautions may be taken to avoid a recurrence.

Enough has already been learned to convince your committee that very unusual conditions obtained in the lake region during Sunday and Sunday night, Nov. 9, especially on Lake Huron, where by far the largest number of catastrophes occurred. Conditions such as never existed before, so far as your committee can learn, and such as may never occur again, at least for many years, were experienced on that memorable date."

The year 1913 was the first in which the association carried 25 per cent of the insurance of its members. During the preceding four years of its existence it had carried only 5 per cent. It was the expectation that 50 per cent would be carried during 1914, but the heavy losses of 1913 dictated a more prudent course for the present. However, if the year 1914 should prove to be profitable, the association will undoubtedly carry 50 per cent during 1915. The fact is, that if the association had carried 25 per cent since it was formed, it would have, after paying all the losses of the November storm, a surplus of \$1,030,000 in its treasury. This excellent showing would have been possible owing to the extremely profitable years of 1911



J. S. ASHLEY
Chairman Advisory Committee

and 1912, when the accidents on the lakes were practically a negligible quantity. It is expected that the underwriters will make some change in the 1914 policy, but the question of rates will not be taken up for a month or more yet. The premium was reduced from $5\frac{3}{4}$ per cent to $4\frac{3}{4}$ per cent for the year and $4\frac{1}{2}$ per cent for the season of 1913. In addition, a preferred class of tonnage enjoyed a rate of 4 per cent for the year and $3\frac{3}{4}$ per cent for the season. A. W. Thompson, George M. Steinbrenner and Ralph D. Mitchell, of Cleveland; L. C. Waldo, of Detroit, and W. M. Mills, of Tonawanda, were appointed a nominating committee. Mr. Thompson, chairman of the committee, reported that owing to the highly satisfactory manner in which the business of the association had been conducted it was deemed advisable to make no change in the advisory committee and the old members were re-elected as follows: J. S. Ashley, J. H. Sheadle, Capt. W. C. Richardson, Capt. C. L. Hutchinson, Harry Coulby, R. A. Williams, W. H. Becker, of Cleveland; C. D. Dyer, of Pittsburgh; John J. Boland, of Buffalo; Wm. Livingstone, of Detroit, and Capt. D. Sullivan, of Chicago. J. S. Ashley was re-elected chairman; Capt. W. C. Richardson, treasurer; Harvey D. Goulder, counsel, and Geo. A. Marr, secretary and attorney-in-fact. Mr. Ashley in his report said: "Too much cannot be said in praise of the loyal co-operation of your masters and other licensed officers in the work of your association. Each year has shown a marked im-

provement in this respect. Our records, however, show several accidents occurred during the year that could have been prevented, and we, therefore, take this opportunity to again impress upon our navigating officers the absolute necessity of at all times strictly obeying all the government rules for navigation and of never under any circumstances taking any chances. 'Safety first. Be sure you are right, then go ahead', should always be in the minds of our navigators.

"Reports also indicate that quite a large number of masters are not using the separate courses on Lakes Huron and Superior which have been recommended by your committee and also by the Lake Carriers' Association. We believe these separate courses would greatly tend to prevent collisions and strongly recommend to all masters that they be used."

During the season of 1913 the association insured 211 vessels of a valuation aggregating \$48,139,633. Of this the association assumed 25 per cent, or \$12,034,883.

"In spite of the fact," said Mr. Ashley, "that the association carried a greater portion of insurance in 1913

than ever before, the expense of operation for the year was smaller than for any year since the association was formed."

Mr. Harvey D. Goulder stated that every one felt that some lesson should be derived from the great November storm.

"Can any changes be made in your ships to make them safer?" he asked. "We should look into the matter thor-

oughly and not consider the question of expenses. It is the duty of the association to do everything possible for the safety of men aboard the vessels. I know vessel owners are anxious to have everything done to make their ships safe and their desires should be put into practical execution."

Ninety-two per cent of the tonnage enrolled in the association was represented at the meeting.

Grain Trade of the Lakes

The grain trade of the great lakes has developed wonderfully during the past decade. In fact, the movement of 1913 is three times that of 1904. THE MARINE REVIEW has tabulated the movement for the past ten years, excluding flour, for the purpose of showing the amount available for transportation in bulk freighters. Figuring 58 lbs. to the bushel, as a general average for all grains, the movement during 1913 totaled 9,372,252 net tons, which is practically equivalent to the total ore movement of twenty years ago.

Following are the figures for the decade:

	1913.	1912.	1911.	1910.	1909.	1908.	1907.	1906.	1905.	1904.
Lake Superior.....	317,051,876	243,110,902	137,924,520	125,505,459	159,773,012	149,500,456	141,599,113	138,614,513	107,550,841	82,959,861
Chicago	55,180,000	47,608,600	73,323,100	57,160,600	41,064,866	38,839,907	66,212,264	60,935,993	68,422,821	56,387,495
Milwaukee	11,867,798	16,655,248	20,198,171	10,894,059	18,811,935	8,390,223	20,674,914	19,061,304	18,439,202	11,828,399
Other ports.....	19,250,672	15,806,389	8,535,765	6,561,053	9,703,490	11,010,600	13,270,154	18,045,691	16,375,388	6,576,944
Total	403,360,346	323,181,139	239,981,556	200,121,171	229,353,303	207,741,186	241,756,445	236,657,501	210,788,252	157,752,699
Totals in net tons...	11,697,160	9,372,252	6,959,465	5,803,514	6,651,245	6,024,493	7,010,937	6,863,068	6,112,859	4,574,828

Lake Coal Movement During 1913

The coal movement on the great lakes during 1913 presents a decided increase over that of any preceding year. It was known that the movement through the canals at Sault Ste. Marie was 3,000,000 tons greater for soft coal and 600,000 tons greater for hard coal than that of 1912, and it now develops that the movement to Lake Michigan ports was also substantially increased. Altogether, 28,328,683 net tons of soft coal and 5,033,696 net tons of hard coal were shipped on the lakes during 1913, making a grand total of 33,362,379 tons. This, of course, includes fuel coal, but as there were approximately the same number of vessels in commission during 1912 and 1913, the chief gain is in cargo coal. Hard coal shipments during the past nine years have been as follows:

Year.	Net tons.
1913.....	5,033,696
1912.....	4,204,741
1911.....	3,917,419
1910.....	3,639,368
1909.....	3,052,706
1908.....	3,538,098
1907.....	3,449,695
1906.....	2,681,808
1905.....	2,785,362

It can be seen from the accompanying table showing the soft coal shipments from the various producing dis-

tricts to Lake Erie docks that the coal trade is rapidly growing and is almost double the movement of even five years ago. The lake tonnage of soft coal from all districts for the past 13 years is shown in the accompanying table:

Year.	Pitts- burgh.	Ohio.	Virginia.	Total.
1901	3,795,706	1,954,825	787,572	6,538,103
1902	4,704,093	2,689,974	965,769	8,359,836
1903	6,092,047	2,458,265	1,539,435	10,089,747
1904	6,058,383	2,138,247	1,279,876	9,476,506
1905	7,443,883	2,062,692	2,109,262	11,615,837
1906	9,287,272	2,560,906	2,743,732	14,591,910
1907	10,549,995	4,074,296	3,420,941	18,037,232
1908	8,700,000	3,600,000	3,450,000	15,750,000
1909	8,687,395	3,002,815	3,874,570	15,564,690
1910	11,911,900	4,297,300	6,629,500	22,838,700
1911	10,611,941	4,019,544	7,151,200	21,782,685
1912	11,300,000	4,676,000	7,360,000	23,335,000
1913	13,415,473	6,176,624	8,736,586	28,328,683

Average Stay in Port

Herewith is published a comparative statement for the years 1906, 1910, 1911, 1912 and 1913, giving the average stays at upper and lower lake ports of vessels of the Pittsburgh Steamship Co. Based upon the figures of 1906, it will be noted that the time of loading and unloading was almost cut in half in 1910, while 1911 shows a decided increase in efficiency over 1910. Neither 1912 nor 1913 have equaled the records of 1911, but it must be borne in mind that 1911 was a year of greatly lessened traffic and that, therefore, there were fewer ships to be handled at docks and consequently a greater state of preparedness to handle them when they came. The record of 1913 is not quite equal to that of 1912, due to labor disturbances at docks.

	Year 1906. Hrs. Min.	Year 1910. Hrs. Min.	Year 1911. Hrs. Min.	Year 1912. Hrs. Min.	Year 1913. Hrs. Min.
Average stay in lower lake ports	36 15	22 22	17 29	20 9	21 19
Average stay in upper lake ports	22 25	12 22	10 50	11 51	13 52
Average time spent in port receiv. & disch'g cargoes	58 38	34 44	28 19	32 ..	35 11
Gross tons.	5,954	6,634	6,306	6,796	7,283
Average cargo carried.....	13,333	13,296	11,159	13,007	12,373
Largest cargo carried.....	9,277	9,788	9,362	10,325	5,897
Fastest loading record.....	in 70 min.	in 45 min.	in 25 min.	in 155 min.	in 75 min.
Rate of fastest loading record, per hour.....	7,288	13,051	22,469	4,136	4,718

Use of Oil in Storm

Capt. Harwood, of the oil tank steamer Narragansett, whose vessel assisted at the rescue of the Volturino's passengers, has made an interesting statement with regard to the use of oil. He said he kept the pumps going under the stern of the Volturino for an hour and 50 minutes, and did not think he poured out more than about 50 tons of lubricating oil through two 4-in. hoses. The effect was marvelous, for he, 10 minutes afterward, launched two boats, the first coming back in 49 minutes with 21 passengers and the second 10 minutes later with eight more. "I believed in oil before," said Captain

Harwood, "but I swear by oil on the troubled waters now. Our experience shows that liners should carry oil tanks as well as boats. They could easily carry 50 to 100 tons. The only drawback that I can see is that if people have to swim in the sea where there is oil they have no chance. If they swallow it they are done." Capt. Harwood added that he had 3,000 tons of lubricating oil on board, and used it because he considered it the least liable to take fire.

The Isthmian Canal Commission has contracted with the American Bitumastic Enamels Co., of New York, for the coating of 40 gas buoys with bitumastic solution and bitumastic enamel at \$25 each.

Wastage of Steel Vessels

During the past 12 years 46 iron and steel vessels have become total losses on the great lakes. These vessels include the iron steamers Clarion and Russia, the British-built steamers Theano, Bannockburn, Wexford, Regina, Leafield, and the Canadian-built steamers James Carruthers and Ottawa. The figures also include the steamers E. M. Peck, I. W. Nicholas, L. C. Waldo and the British-built steamer Turret Chief, which have been abandoned as constructive total losses, though there is a possibility that they may yet be recovered.

Of this wastage of 46 steel vessels during the past 12 years, 16 of them are to be credited to 1913, and of the 16 14 were wrecked in the great November storm. A table is herewith published showing the total losses of steel tonnage for the past 12 years.

Looking back it is singular how many of them have the element of mystery in their destruction. No one knows what happened to the Bannockburn, in 1902, the Cyprus, in 1907, the Clemson, in 1908, the car ferry Marquette & Bessemer No. 2, in 1909, and the Pere Marquette No. 18, in 1910, and no one came ashore from the Bannockburn, Clemson or car ferry Marquette & Bessemer No. 2. One man came ashore from the Cyprus, but he had no coherent message. Thirty-two members of the crew were saved when the car ferry Pere Marquette No. 18 foundered, but not one of them knew what had occurred aboard ship to make her founder.

Eight ships totally disappeared on Lake Huron in the great November storm and two on Lake Superior, and as not a single life was saved on any of them, what occurred is mere conjecture.

Following is the table:

Year.—Name of vessel.	Carrying capacity, gross tons.
1913—Str. Charles S. Price.....	9,000
1913—Str. Isaac M. Scott	9,000
1913—Str. H. B. Smith.....	10,000
1913—Str. John A. McGean.....	7,500
1913—Str. Argus	7,000
1913—Str. Hydrus	7,000
1913—*Str. L. C. Waldo.....	7,000
1913—*Str. H. M. Hanna Jr.....	8,500
1913—*Str. Matoa	3,104
1913—Str. James Carruthers	9,500
1913—Str. Wexford	2,800
1913—Str. Regina	3,000
1913—Str. Leafield	3,500
1913—*Str. Turret Chief	3,100
1913—*Str. I. W. Nicholas.....	3,859
1913—*Str. E. M. Peck.....	3,000
1912—Str. James Gayley	7,500
1911—Str. Joliet	2,777
1911—Str. John Mitchell	7,500
1911—Str. Turret Cape	3,100
1910—Str. Frank H. Goodyear.....	6,900
1910—Str. W. C. Moreland	12,000
1910—Str. John Sharples	2,800
1910—Carly Pere Marquette No. 18.	5,000
1909—Str. Aurania	4,500
1909—Str. Clarion	3,000
1909—Str. John B. Cowle.....	6,500
1909—Str. Ottawa	3,500
1909—Str. Russia	2,800

1909—Car ferry Marquette & Bessemer No. 2.....	7,800
1908—Str. D. M. Clemson.....	3,000
1908—Pkg. Frtr. North Star.....	7,000
1907—Str. Cyprus	3,255
1906—Str. Grecian	2,600
1906—Str. Theano	4,500
1905—Str. Sevona	6,250
1905—Str. Etruria	3,100
1905—Str. Thos. W. Palmer.....	6,588
1905—Str. Lafayette	7,000
1905—Sch. Madeira	3,272
1905—Str. Vega	2,900
1905—Str. Ira H. Owen.....	1,500
1904—None.....	2,500
1903—Str. Queen of the West.....	3,000
1902—Whaleback Barge 129.....	
1902—Str. Bannockburn	

*Constructive total loss.

Commerce of Lake Superior

The report of the superintendents of canals at Sault Ste. Marie shows that 23,795 ships of 57,989,715 net tons register passed through the canals during 1913. Of this number 15,599 of 32,062,619 net tons used the United States canal and 8,196 of 25,927,096 net tons used the Canadian canal. The total freight movement was 79,718,344 net tons, of which 37,022,201 tons were carried through the United States canal, and 42,696,143 tons through the Canadian canal. The movement of freight is 7,245,668 tons greater than that of 1912. It will be seen that, while the number of vessels using the Canadian canal is only about half the number using the American canal, yet the Canadian canal carries the greater portion of freight, proving conclusively that the larger class of vessels use the Canadian canals.

The United States canal opened April 18 and closed Dec. 18, a season of 245 days. The Canadian canal opened April 14 and closed Dec. 15, a season of 246 days.

Items.	Total traffic for		Increase or decrease.	
	Season 1912.	Season 1913.	Amount.	Per cent.
Vessels:				
Steamers, number	19,076	19,789	713	4 ..
Sailing, number	1,805	1,992	187	10 ..
Unregistered, number	1,897	2,014	117	6 ..
Total, number	22,778	23,795	1,017	4 ..
Lockages, number	16,088	16,867	779	5 ..
Tonnage:				
Registered, net	56,736,807	57,989,715	1,252,908	2 ..
Freight, short	72,472,676	79,718,344	7,245,668	10 ..
Passengers, number	66,877	77,194	10,317	15 ..
Coal:				
Hard, short tons	2,142,485	2,744,574	602,089	28 ..
Soft, short tons	12,789,109	15,878,364	3,089,255	24 ..
Flour, barrels	8,652,153	10,212,667	1,560,514	18 ..
Wheat, bushels	174,086,456	204,821,507	30,735,051	18 ..
Grain, bushels	69,024,546	112,230,369	43,205,823	63 ..
Mfd. and pig iron, short tons.....	654,892	402,912	251,980	.. 38
Salt, barrels	660,991	730,431	69,440	11 ..
Copper, short tons	116,954	85,378	31,576	.. 27
Iron ore, short tons	46,303,423	48,109,353	1,805,930	4 ..
Lumber, M. ft. B. M.	667,542	599,586	67,956	.. 10
Building stone, short tons	2,282	6,181	3,899	171 ..
General mdse, short tons.....	1,664,783	1,770,860	106,077	6 ..

McNab Direction Indicators

Among the latest prominent steamers in this country that have recently been equipped with the McNab direc-

tion indicators are: The Chesapeake Steamship Co.'s new passenger steamers City of Annapolis and City of Richmond, built at Sparrow's Point. These valuable instruments have also been installed on the eight new vessels of The American-Hawaiian Steamship Co., built at the same yards.

McNab direction indicators were also installed on the new steamship Congress, of the Pacific Coast Steamship Co., recently completed at Camden, N. J. The above instruments were supplied by The McNab Co., Bridgeport, Conn.

The McNab Marine Appliances, Ltd., London, E. C., has recently received an order to equip the trans-Atlantic fleet of the Anchor Line, Glasgow, including the Cameronia, Columbia, California, and Caledonia; also the new P. & O. liner Kaiser-I-Hind, now completing at Greenock, Scotland, and the six destroyers now building at Cowes, England, for the Chilean navy.

British Tank for Mexican Oiler Trade

The oil tank steamer San Hilaris, one of ten large tank steamers which are being constructed to the order of the Eagle Oil Transport Co. Ltd., for the transport of oil from Mexican oil fields, was launched at Jarrow for the Anglo-Mexican Petroleum Products Co., Ltd., which is the sales organization engaged in the export of Mexican petroleum products. The San Hilaris carries 15,000 tons dead-weight and is constructed in accordance with Lloyds highest class and under their special survey, for the carriage of oil in bulk. The vessel is also

built in accordance with the latest requirements for the Suez canal and the Board of Trade regulations. Her length is 550 ft. and she is fitted with wireless.

Bulk Freighter and Lake Trade

The tables accompanying this article are of value to everyone identified with the bulk freight trade of the Great Lakes. Table No. 1 shows the additions and subtractions which have been made to the fleet of bulk freighters during the past nine years, or since the advent of the so-called "big ship" on the lakes. The launchings given are those of bulk freighters only. The subtractions given are also bulk freighters only and are made up of actual losses through the elements, removals to the coast or transfers to other trades.

The figures show that during the past nine years 184 bulk freighters have been added to the available fleet and 151 removed. In compiling this table of bulk freighters the lumber carriers and package freighters have been eliminated. Table No. 2 gives the movement of bulk freight (iron ore, coal and grain) on the great lakes during the past nine years. Last year the grain figures in this table also included flour. As the bulk

package freighters and lumber carriers undoubtedly made some inroads into the coal and grain trades. During 1910, 80,014,591 net tons of freight were moved and there were available on Jan. 1, 1910, 589 bulk freighters of 2,973,447 gross tons to move it. This was of course considerable excess of tonnage capacity over freight

speed and heavy pressure bearings. has just issued a calendar intended for practical use. The type is very large and the dates may readily be read across a large room.

The Heath & Milligan Mfg. Co., paint and color makers since 1851, have put out a calendar of extreme interest to the marine trade in that

TABLE III.
CARRYING CAPACITY OF LAKE BULK FREIGHTERS

Year.	No. of vessels. Jan. 1.	Tonnage of same. Gross tons.	Carrying capacity	
			New tonnage constructed. Gross tons.	Tonnage subtracted. Gross tons.
1905.....	518	1,919,285	260,200	114,374
1906.....	514	2,065,111	381,000	40,987
1907.....	542	2,442,754	368,000	46,973
1908.....	567	2,766,781	101,400	14,837
1909.....	587	2,853,344	157,300	37,197
1910.....	589	2,973,447	194,500	60,617
1911.....	592	3,108,330	55,000	29,477
1912.....	589	3,135,953	49,500	60,945
1913.....	572	3,124,508	28,000	120,919
1914.....	548	3,031,589	.....	.....

freighters do not carry flour, the table published this year is for grain exclusive of flour.

Table No. 3 gives the number and capacity of bulk freighters available to carry this freight. On Jan. 1, 1905, there were 518 bulk freighters of 1,919,285 gross tons carrying capacity on the lakes. During 1905, 58,007,070 net tons of freight were moved on the lakes. Thirty cargoes is probably a high average for a season and if

it contains time and distance tables between the leading ports. The calendar also gives a picture of the Clermont, built by Robert Fulton in 1807.

The Churchill Line, Savannah, Ga., has put out a very attractive calendar for 1914, illustrated with various types of ships. The frontispiece bears an excellent reproduction of the steamship Savannah, which was the first steamer to be built in the United States and the first to cross the Atlantic.

The American-Hawaiian Steamship Co., 8 Bridge street, New York, has issued a splendid calendar for 1914. It contains a fine map of the United States and Central America and shows in lines of red the routes which the ships of this fleet now follow to reach the Hawaiian Islands and the route that they will follow as soon as the Panama canal is opened to navigation.

One of the most attractive calendars that has reached this office is issued by the Northern Malleable Iron Co., of St. Paul, Minn., the pictorial feature of which is a reproduction of Charles C. Curran's painting entitled "When All the World is Sunshine." The painting represents three girls apparently overlooking the sea from a cliff. The picture is full of light and is one of the most attractive things that Curran has ever done.

The American-Hawaiian Steamship Co. is building a pier 900 ft. long and 150 ft. wide with a two-story structure upon it at the foot of Forty-first St., Brooklyn, N. Y., in anticipation of increased trade when the Panama canal is opened to navigation.

TABLE I.

Year.	Launch- ings.	Sub- tractions.
1905.....	29	33
1906.....	40	18
1907.....	40	16
1908.....	24	4
1909.....	17	5
1910.....	20	17
1911.....	5	8
1912.....	5	22
1913.....	4	28
Total	184	151

freighters do not carry flour, the table published this year is for grain exclusive of flour.

Table No. 3 gives the number and capacity of bulk freighters available to carry this freight. On Jan. 1, 1905, there were 518 bulk freighters of 1,919,285 gross tons carrying capacity on the lakes. During 1905, 58,007,070 net tons of freight were moved on the lakes. Thirty cargoes is probably a high average for a season and if

Calendars

C. F. Harms Co., 17 South St., New York, have put out their annual calendar indicating high and low water at Sandy Hook, Governor Island and Hell Gate, as well as recording the

Table II.
BULK FREIGHT MOVEMENT OF THE GREAT LAKES

Year.	Iron ore, gross tons.	Coal, net tons.	Grain of various kinds, net tons.	Total, net tons.
1905.....	33,476,904	14,401,199	6,112,859	58,007,070
1906.....	37,513,589	17,273,718	6,863,068	66,152,006
1907.....	41,290,709	21,486,927	7,010,937	74,743,458
1908.....	25,427,094	19,288,098	6,024,493	53,790,938
1909.....	41,683,599	18,617,396	6,651,245	71,954,272
1910.....	42,618,758	26,478,068	5,803,514	80,014,591
1911.....	32,130,411	25,700,104	6,959,465	68,645,629
1912.....	47,435,777	27,539,741	9,372,252	89,040,063
1913.....	49,070,478	30,439,741	11,697,160	97,095,836

all of these bulk freighters had moved 30 cargoes they would have moved 57,578,550 gross tons during that year. Of course the bulk freighters did not move all of this freight because the

phases of the moon. It is certainly most handy and convenient.

I. Shonberg, 122 Flushing avenue, Brooklyn, N. Y., manufacturer of Shonberg's M. M. white bronze for high

Bulk Freighters Built Since 1902

*Showing the Splendid Fleet That Has Been
Created in the Great Lakes in Recent Years*

SHIP building for the bulk freight trade of the great lakes for the past year or two has been quiet, but the aggregate as viewed for the past decade is considerable. A great fleet of vessels has been brought into existence during the past ten years and the sudden accession of so much floating property has developed many problems of operation. Private enterprise in responding to the demands of commerce has outstripped governmental aid. A more comprehensive and elastic system is needed and more co-ordination required among the various departments of the government service having to do with lake trade.

Contrary to general belief, the greater part of the tonnage constructed during the past decade has been for independent interests, that is to say, interests that are in no way associated with the mining and smelting of ore—in other words, the vessel-owning interests pure and simple.

Beginning in 1902

From the beginning of 1902 to the close of 1913 inclusive, vessels aggregating 1,247,600 gross tons carrying capacity on a single trip have been built for independent interests, as against vessels having a carrying capacity of 858,000 gross tons on a single trip for interests that have their own mines or furnaces or both.

The year 1913 was one of an excellent movement of freight, and notwithstanding the fact that stages of water were much improved and that every vessel carried a fair increase in cargo per trip, all the vessels were reasonably well employed throughout the year.

The program of new construction for 1914 as so far announced is a moderate one. Of the seven bulk freighters under order, five of them are for independent interests and two for interests that own their own mines. There is appended herewith a list of bulk freighters constructed on the lakes since 1902. Since the construction of the Wolvin in 1904 only one vessel less than 400 ft. in length, the R. W. England, has been built on the great lakes for the bulk freight trade, except, of course, the canalers, while 38 vessels of the 400-ft. class and over, 107 vessels of the 500-ft. class and over, and 31 vessels of the 600-ft. class and over have been built.

BULK FREIGHTERS BUILT SINCE 1902

Name	Length overall, feet	Carrying capacity, gross tons.
A. G. BROWER.....	366	4,800
G. J. GRAMMER.....	366	4,800
E. M. SAUNDERS.....	400	5,500
W. H. GRATWICK.....	436	6,200
W. W. BROWN.....	366	4,800
H. S. WILKINSON.....	390	5,000
JAMES GAYLEY.....	436	6,200
BRANSFORD.....	436	6,200
ETRURIA.....	434	6,200
SONORA.....	366	4,800
SULTANA.....	366	4,800
C. W. WATSON.....	400	5,500
F. W. HART.....	400	5,500
WM. NOTTINGHAM.....	400	5,500
A. E. STEWART.....	376	5,000
LUZON.....	366	4,800
STEEL KING.....	400	5,500
WM. F. FITCH.....	366	4,800
W. C. RICHARDSON.....	374	4,900
L. C. SMITH.....	434	6,200
J. M. JENKS.....	434	6,200
HAROLD B. NYE.....	400	5,500
PANAY.....	366	4,800
JAMES H. HOYT.....	376	5,000
FRANK H. GOODYEAR.....	436	6,200
MOSES TAYLOR.....	436	6,200
GEORGE B. LEONARD.....	400	5,500
H. B. HAWGOOD.....	434	6,200
JOHN B. COWLE.....	440	6,500
CHARLES BEATTIE.....	220	2,000
THOMAS ADAMS.....	376	5,000

Year 1903.

JAMES S. KEEFE.....	255	2,800
W. H. MACK.....	374	4,900
HURLBURT W. SMITH.....	434	6,200
SINALOA.....	436	6,200
ROBERT WALLACE.....	255	2,800
ANNA C. MINCH.....	400	5,500
MONROE C. SMITH.....	400	5,500
C. M. WARNER.....	390	5,250
JOHN LAMBERT.....	255	2,800
B. LYMAN SMITH.....	400	5,500
D. G. KERR.....	468	6,900
SAXONA.....	436	6,200
JOHN SHARPIES.....	255	2,800
WILBERT L. SMITH.....	400	5,500
JOHN CRERAR.....	255	2,800
ALBERT M. MARSHALL.....	255	2,800
H. G. DALTON.....	255	2,800
D. M. CLEMONS.....	468	6,900
LOUIS WOODRUFF.....	436	6,200
A. D. DAVIDSON.....	255	2,800
GEORGE C. HOWE.....	255	2,800
S. N. PARENT.....	255	2,800
JAMES H. REID.....	468	6,900
G. WATSON FRENCH.....	376	5,000
SONOMA.....	436	6,200
F. W. GILCHRIST.....	436	6,200
J. L. WEEKS.....	436	6,200
R. L. IRELAND.....	436	6,200
R. E. SCHUCK.....	436	6,200
P. P. MILLER.....	375	4,900
WESTERN STAR.....	435	6,200
PERRY G. WALKER.....	436	6,200
J. C. GILCHRIST.....	436	6,200
HENRY S. SILL.....	436	6,200
WISCONSIN.....	434	6,200
EDWIN F. HOLMES.....	434	6,200
F. B. SQUIRE.....	430	6,200
WINNEBAGO.....	234	2,100
JOHN O. HOWARD.....	241	2,500
GEORGE L. CRAIG.....	404	5,600
KENSINGTON.....	380	5,000

Year 1904.

UMBRIA.....	440	6,500
FRANCIS WIDLAR.....	436	6,200
AUGUSTUS B. WOLVIN.....	560	10,000
SAHARA.....	494	8,000
MARTIN MULLEN.....	436	6,200
BALL BROTHERS.....	500	8,000
R. W. ENGLAND.....	376	5,000

Year 1905.

FRANCIS L. ROBBINS.....	400	5,500
JAMES C. WALLACE.....	552	10,000
PHILIP MINCH.....	500	8,000
SYLVANIA.....	524	9,000
AMASA STONE.....	545	10,000
L. C. HANNA.....	524	9,000

E. H. GARY.....	569	10,500
S. M. CLEMENT.....	500	8,000
SOCAPA.....	524	9,000
LYMAN C. SMITH.....	545	10,000
W. E. COREY.....	569	10,500
W. A. PAINE.....	500	8,000
W. A. ROGERS.....	545	10,000
POWELL STACKHOUSE.....	524	9,000
H. C. FRICK.....	569	10,500
JOHN STANTON.....	524	9,000
JOSEPH G. BUTLER JR.....	545	10,000
PENDENNIS WHITE.....	436	6,200
W. K. BIXBY.....	500	8,000
JAMES B. WOOD.....	534	9,500
JAMES E. DAVIDSON.....	524	9,000
GEORGE H. RUSSEL.....	484	7,600
HOOVER AND MASON.....	524	9,000
PETER WHITE.....	524	9,000
FRANK J. HECKER.....	484	7,600
W. G. MATHER.....	531	9,300
FRANK C. BALL.....	550	10,000
B. F. JONES.....	550	10,000
JAMES P. WALSH.....	500	8,000

Year 1906.

JOSEPH SELLWOOD.....	545	10,000
E. D. CARTER.....	524	9,000
CHARLES S. HEBARD.....	524	9,000
LOFTUS CUDDY.....	545	10,000
ABRAHAM STEARN.....	545	10,000
DAVID Z. NORTON.....	500	8,000
JOHN SHERWIN.....	534	9,500
HARRY COULBY.....	569	10,500
HARVEY D. GOULDER.....	545	10,000
J. PIERPONT MORGAN.....	600	12,000
HENRY B. SMITH.....	545	10,000
SIR THOMAS SHAUGHNESSY.....	500	8,000
E. J. EARLING.....	545	10,000
CHARLES WESTON.....	569	10,500
HENRY H. ROGERS.....	600	12,000
WM. G. POLLOCK.....	400	6,500
J. O. RIDDLE.....	552	10,000
JOSHUA RHODES.....	440	6,500
A. Y. TOWNSEND.....	602	12,000
NORMAN B. REAM.....	600	12,000
HENRY A. HAWGOOD.....	552	10,000
WM. E. FITZGERALD.....	440	6,500
D. R. HANNA.....	552	10,000
PETER A. B. WIDENER.....	600	12,000
JAMES S. DUNHAM.....	400	6,500
D. J. MORRELL.....	602	12,000
SAMUEL PARKER.....	550	10,000
SHELDON PARKS.....	552	10,000
JAMES F. MORROW.....	440	6,500
GEN. GARRETSON.....	540	10,000
W. B. KERR.....	605	12,000
WILLIAM P. SNYDER.....	550	10,000
JAMES LAUGHLIN.....	550	10,000
MICHIGAN.....	550	10,000
ISHPEMING.....	550	10,000
E. L. WALLACE.....	445	6,700
J. H. SHEADLE.....	550	10,000
JOHN MITCHELL.....	440	6,500
EUGENE ZIMMERMAN.....	500	8,000
SIERRA.....	458	6,800

Year 1907.

MATHEW ANDREWS.....	552	10,000
HUGH KENNEDY.....	552	10,000
J. H. BARTOW.....	524	9,000
THOMAS LYNCH.....	600	12,000
H. P. MCINTOSH.....	540	10,000
HENRY PHIPPS.....	600	12,000
ISLAND S. DEGRAFF.....	605	12,000
GEORGE F. BAKER.....	600	12,000
CHARLES O. JENKINS.....	524	9,000
HEMLOCK.....	440	6,500
WM. M. MILLS.....	605	12,000
JAY C. MORSE.....	552	10,000
ODONAH.....	440	6,500
CALUMET.....	440	6,500
CYPRUS.....	440	6,500
SALT LAKE CITY.....	552	10,000
CRETE.....	440	6,500
WARD AMES.....	552	10,000
I. J. SULLIVAN.....	552	10,000
EDWIN N. OHL.....	440	6,500
ARTHUR H. HAWGOOD.....	569	10,500
VERONA.....	440	6,500
WM. A. HAWGOOD.....	552	10,000
ADRIATIC.....	440	6,500
H. P. BOPE.....	552	10,000
ELBA.....	440	6,500
CHARLES W. KOTCHER.....	440	6,500
THOMAS BARLUM.....	500	8,000
CALDERA.....	524	9,000
THOMAS F. COLE.....	605	12,000

D. O. MILLS.....	552	10,000
WM. B. DAVOCK.....	440	6,500
WILPEN.....	574	11,000
MILINOKETT.....	524	9,000
JOHN L. BOLAND.....	500	8,000
JOSIAH G. MUNRO.....	552	10,000
JACOB T. KOPP.....	500	8,000
CHARLES HUBBARD.....	460	6,800
SMITH THOMPSON.....	458	6,800
JOHN DUNN JR.....	524	9,000

Year 1908.

B. F. BERRY.....	569	10,500
WAINWRIGHT.....	440	6,500
J. J. H. BROWN.....	452	6,700
JOHN A. MCGEAN.....	440	6,500
J. E. UPSON.....	524	9,000
WM. H. TRUESDALE.....	452	6,700
A. W. THOMPSON.....	524	9,000
A. E. NETTLETON.....	545	10,000
WILLIAM H. WOLFF.....	524	9,000
RUFUS P. RANNEY.....	440	6,500
HOWARD M. HANNA JR.....	500	8,000
JOHN A. DONALDSON.....	400	5,500
W. R. WOODFORD.....	552	10,000
PRICE MCKINNEY.....	452	6,700
J. F. DURSTEN.....	452	6,700
HONDURAS.....	256	2,800
NORMANIA.....	440	6,500
M. A. BRADLEY.....	480	7,500
HARRY A. BERWIND.....	557	10,000
WILLIAM LIVINGSTONE.....	557	10,000
ADAM E. CORNELIUS.....	440	6,500
JAMES CORRIGAN.....	550	10,000
DANIEL B. MEACHAM.....	550	10,000
THEODORE H. WICKWIRE.....	464	6,800
FRED G. HARTWELL.....	524	9,000

Year 1909.

ALVA C. DINKEY.....	600	12,000
EUGENE J. BUFFINGTON.....	600	12,000
ALPENA.....	374	5,000
LA BELLE.....	524	9,000
ANDREW S. UPSON.....	400	5,500
JOHN J. BARLUM.....	524	9,000
BENJAMIN NOBLE.....	256	2,800
ISAAC M. SCOTT.....	524	9,000
G. A. TOMLINSON.....	524	9,000
J. S. ASHLEY.....	524	9,000
WM. B. SCHILLER.....	600	12,000
JOHN P. MORGAN JR.....	600	12,000
A. A. AUGUSTUS.....	524	9,000
CLIFFORD F. MOLL.....	464	6,800
SHENANGO.....	607	12,000
DENMARK.....	460	6,700

Year 1910.

LEONARD B. MILLER.....	524	9,000
JOHN P. REISS.....	524	9,000
JOHN B. COWLE.....	545	10,000
CHARLES L. HUTCHINSON.....	524	9,000
JOSEPH WOOD.....	524	9,000
A. M. BYERS.....	524	9,000
CHARLES S. PRICE.....	524	9,000
E. H. UTLEY.....	524	9,000
PETER REISS.....	524	9,000
W. C. MORELAND.....	600	12,000
ONTARIO.....	465	6,800
CHAMPLAIN.....	465	6,800
HARRY E. YATES.....	550	10,000
ST. CLAIR.....	465	6,800
THEO. H. WICKWIRE JR.....	550	10,000
W. J. OLCOTT.....	605	12,000
WM. B. DICKSON.....	605	12,000
WM. P. PALMER.....	600	12,000
WILLIS L. KING.....	600	12,000
NORWAY.....	524	9,000

Year 1911.

WM. C. AGNEW.....	552	10,000
THOMAS WALTERS.....	600	12,000
QUINCY A. SHAW.....	524	9,000
THE HARVESTER.....	545	10,000
COL. J. M. SCHOONMAKER.....	617	14,000

Year 1912.

W. P. SNYDER JR.....	617	14,000
LOUIS R. DAVIDSON.....	524	9,000

Year 1913.

JAMES FARRELL.....	600	12,000
PERCIVAL ROBERTS JR.....	600	12,000
RICHARD TRIMBLE.....	600	12,000
JAMES CARRUTHERS.....	559	9,500
A. C. DUSTIN.....	545	9,000
A. D. MACTIER.....	257	3,000
F. P. JONES.....	257	3,000

Average Ore Cargo for 1913

The average cargo carried on the great lakes during 1913 was 8,107 gross tons. This was 367 tons greater than the cargo carried in 1912 and 929 tons greater than the average cargo carried in 1911, doubtless due to more favorable stages of water. It is, however, 218 tons less than the average cargo carried during 1908. It will be recalled that the season of 1908 was an extremely poor one and a few of the smaller vessels were placed in commission, which accounts for the large average cargo of that year. It can be seen, however, that that figure is being rapidly overtaken and may be passed in 1914. Following are the average cargoes for the past 19 years:

Year.	Gross tons.	Year.	Gross tons.
1895.....	1,800	1904.....	5,272
1896.....	2,202	1905.....	6,101
1897.....	3,556	1906.....	6,973
1898.....	3,517	1907.....	7,516
1899.....	3,803	1908.....	8,325
1900.....	3,783	1909.....	7,777
1901.....	4,459	1910.....	7,155
1902.....	4,899	1911.....	7,178
1903.....	5,668	1912.....	7,740
		1913.....	8,107

Obituary

The news of the sudden death of Russell C. Wetmore, vice president and treasurer of the American Ship Building Co., at his home in Cleveland on Tuesday evening, Jan. 20, came as a profound shock to vessel interests in general. Few knew that he was ill and none regarded his illness as serious. He went home from his office on the preceding Wednesday in perfect health, but on Thursday was seized with a chill which developed into pneumonia. He appeared to be surmounting the attack, however, because on Tuesday afternoon he sent for his secretary to arrange some business matters. Five hours later he died.

No one could come in contact with Mr. Wetmore without being sensible of the charm of his personality. He was a gentleman and his breeding showed itself in everything that he said or did. He had been identified directly and indirectly with lake interests all his life. As a boy he went to Marquette and was familiar with the ore-producing properties which form so large a part of lake trade. His one diversion from the lakes was when he entered the employ of the Chicago Telephone Co. as secretary and treasurer. He later identified himself with the American Steel Barge Co., and when this company was taken over by the Superior Ship Building Co., Mr. Wetmore went with it, and when the Superior Ship Building Co.

consolidated with the American Ship Building Co., in 1899, Mr. Wetmore was made secretary and treasurer of the American Ship Building Co. Two years ago he was elevated to the vice presidency, still retaining the treasurer'ship. Mr. Wetmore was a director of the National Commercial Bank and a member of the Union, Country and Mayfield Clubs. He was also active in the affairs of St. Paul's Episcopal church. He leaves a widow and a daughter, Mrs. Arthur C. Brooks.

The late James Howden, of forced draft fame, had a notable career. He possessed a highly original mind. He made compound engines and water-tube boilers as far back as 1859 with a pressure of 100 pounds, when the accepted engines were single cylinder with a pressure of 25 lbs. He prepared designs for a triple-expansion engine using steam at 150 to 200 lbs. pressure, but as he did not actually manufacture them, he is not regarded as the inventor. He began his investigations into the problem of forced draft in 1862, and continued them until the early '80's, at last perfecting the system now associated with his name. Mr. Howden was never better pleased than when he was probing some baffling engineering problem, and he had a genius for inventing, developing and improving mechanical appliances.

Caleb Emory Gowen, one of the founders of the Kelley Island Lime & Transport Co., and long identified with various constructive enterprises at Cleveland, died on Jan. 8, of apoplexy, at the age of 58 years.

J. W. Crowell, pioneer ship builder of California, and later engaged in the same industry in Cambridge, Md., died at Cambridge, Jan. 24, at the age of 82 years.

Thomas I. Windsor, general manager of the Boston Tow Boat Co., died at Boston on Dec. 29.

The Ellis Landing & Dock Co. have engaged Havaland, Dozier & Tibbetts at San Francisco to prepare specifications for bulkheading, dredging and filling of 88 acres of land situated across the bay in Richmond facing the Golden Gate. A canal will be dredged 1,800 ft. long, 120 ft. wide and 20 ft. deep with a turning basin 186 ft. in diameter with wharves 58 ft. wide on each side of the entire length of the canal.

If Captain William Connell and his wife, Agnes Jane Connell, will communicate with THE MARINE REVIEW a letter of interest will be forwarded to them.

WITH THE AUXILIARY MAKERS

Hynd Automatic Safety Engine Lock

One of the most interesting exhibits in the marine appliance room at the Lake Carriers' Association was a full-sized model of an automatic safety engine lock, invented by Alexander Hynd. The purpose of the lock is to automatically prevent any misunderstanding of signals by locking the operating lever against any movement except the one indicated by the signal. The device is a lock mounted on the bracket carrying the operating levers, which is electrically operated and is connected with suitable contact plates on the receiving dial of the engine telegraph. The lock has two locking bars, one for the ahead and one for the astern position, which are operated in accordance with the motion of the pointer on the telegraph dial, so that if an ahead signal is given, the lock prevents the lever being moved into the astern position, and if an astern signal is given, the opposite lock comes in action to prevent the lever being moved into the ahead position. The operator cannot make a mistake in complying with the signal.

If, to get the engine started, it is necessary for the operator to move the lever contrary to the signal given the lock may be opened by means of a small lever, allowing the lever to pass, but immediately returning to locked position when released, and as the lever is brought back to position to comply with the signal it will trip the lock, which, when the lever has passed, again returns to locked position, and will not leave this position until an opposite signal has been given and the opposite lock has come into action. A bell is attached to the lock or otherwise conveniently located, so that in case of the above operation, when the lever is in position contrary to the signal, an alarm will at once be sounded and will continue to sound while the lever remains in this position. Further particulars may be obtained from Mr. Hynd, 872 Rockefeller building, Cleveland.

The McNab Specialties

Alexander McNab, the inventor of a number of engineering specialties of value, which are manufactured by the McNab Co., of Bridgeport, Conn., attended the annual meeting of the Lake Carriers' Association, in Detroit,

and displayed a number of models, including the Cascade boiler circulator, the McNab draught gage, the McNab engine indicator and the Willet-Bruce system of steamship whistle control. During the convention, Mr. McNab took orders to equip the following lake steamers with the Cascade boiler circulator: The Harvester, Lackawanna, Clifford Moll, Leonard B. Miller, W. S. Mack, Moses Taylor, E. W. Oglebay and the new boat building for Capt. W. C. Richardson. Two vessels, belonging to the Vance & Joys fleet, the new Hanna steamer and the new Richardson steamer, will be equipped with the McNab engine indicator and the new conveyor steamer building for the Wyandotte Transportation Co. will have the McNab draught gage, which shows the draught forward, amidships and aft. The McNab specialties are handled on the lakes by Alexander Hynd, 872-874 Rockefeller building, Cleveland.

Jacques-Huff Davit Winch

A demonstration of a Jacques-Huff davit winch and releasing hook was given on the steamer *Pleasure*, at Detroit, on Nov. 1, in the presence of the inspectors of steam vessels and various vessel owners. This device has been installed on the lake passenger steamers *Essex* and *South American*, the bulk freighter *Dunham* and the Michigan Alkali Co.'s steamer. A model of the winch was on exhibition at the convention of the Lake Carriers' Association, in Detroit, Jan. 22 and 23, and attracted much attention. The device is all steel and is easily adjusted to any davit while the boat is in service. The device can be operated by one man at each davit and one man has full control while it is being lowered to the water with a load of passengers. A test proved that 9 lbs. 15 oz. on the controller held the weight of 2,100 lbs. Full particulars will be sent to anyone interested by the Jacques-Huff Co., 329 Belvidere avenue, Detroit.

McArthur Portable Ladder

The McArthur portable ladder, which is meeting with general favor for use aboard ships, was displayed in the marine appliance room at Hotel Cadillac, Detroit, during the convention of the Lake Carriers' Association, by Capt. Charles A. Anderson. Considerable improvement has been made

in this ladder during the past year, and being a combination of the strongest metals, its life is practically indefinite. An individual metallic case is provided for the ladder when not in use. Capt. Anderson is a born salesman and his natural persuasiveness kept a crowd about the exhibit all the time. No one can beat a sailor selling to a sailor.

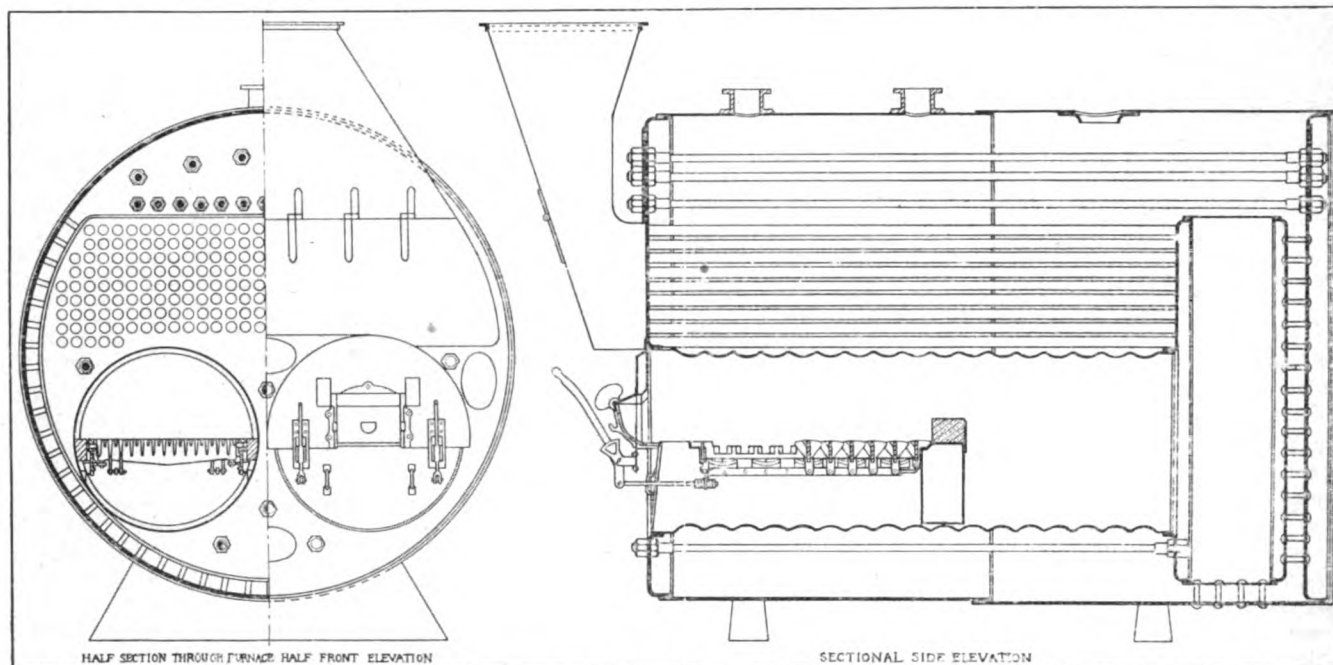
The Brude Life Boat

One of the most interesting exhibitions at the annual convention of the Lake Carriers' Association was a model of the Brude life boat, attention to which has been drawn in THE MARINE REVIEW hitherto. The model, which occupied a rather important position in the lobby of the Cadillac, was continually surrounded by vessel masters who were quick to see its merits. This boat has proved its seaworthiness and general efficiency in sailing across the Atlantic from Norway to this country in mid-winter.

The Brude life boat is a closed boat and therefore protects from exposure all rescued people. There is no doubt whatever that in the November storm on the lakes the Brude boat would have got ashore safely. It is proposed to sail one of the Brude boats from New York to Paris in February of the present year to again demonstrate its seagoing qualities. The agent for the great lakes is Capt. B. T. Haagenon, and one of the Brude boats is installed on the car ferry *Ashtabula*. The merits of the Brude boat have been presented to the British board of trade and to congress, and there is a great deal to be said in its favor. It certainly has undeniable advantages over the open type of boat.

A Shaking Grate for Marine Boilers

The tremendous waste of heat resulting from the usual method of cleaning fires in marine boilers by use of the slice bar and hoe through open furnace doors has long been a matter of serious concern to marine engineers. The condition has been endured, however, because it has been generally considered impractical to adapt the usual forms of shaking grates and mechanical stokers to the cramped space available on shipboard. Recently a shaking grate specially designed for installation in Morison fur-



THE SHEAR KLEAN SHAKING GRATE

naces of Scotch marine boilers operating with either natural or forced draft has been produced by the Marion Machine, Foundry & Supply Co., Marion, Ind., and is being marketed by the patent licensees, the Shear-Klean Grate Co., Monadnock bldg., Chicago.

A typical installation of this type of grate is shown in the accompanying illustration. The grate bars are of the interlocking type and the webs are extra deep to withstand the warping effects of the high heat in marine furnaces. The bars present considerable radiating surface which serves to preheat the incoming air. The spaces between the bars are proportioned to the type of boiler and the draft and are also so adjusted that it is impossible to dump sufficient cinders at one time to fill up the ash pit.

Each alternate bar rocks against a horizontal cam fitted to the side of the grate, which imparts a sliding motion resulting in a shearing action between adjacent bars that is said to effectually break up the clinkers. The amount of grate action is directly proportioned to the throw of the shaking lever at the front of the boiler. The shaking grate obviates the necessity for opening the furnace doors to clean fires and therefore materially improves the thermal efficiency of the boiler.

The Westinghouse Machine Co. has been awarded contract for the turbine reduction gearing for the battleship Pennsylvania, the repair ship Melville and battleship No. 39 recently auth-

orized by congress. This gear was developed by the late Rear Admiral George W. Melville in conjunction with John M. MacAlpine at the Westinghouse plant, George Westinghouse personally lending them all possible assistance.

Dock Lighting at Colon

An extensive system of lighting is being installed on the new docks at Cristobal, formerly known as docks Nos. 17 and 16, but recently renumbered 8 and 9. The system provides for a total of 350 250-watt electric lights inside and outside of the superstructure. These lights will be arranged in nine rows, spaced 30 ft. apart, seven rows extending the length of the dock structure on the inside and one row along each side of the docks outside and also across the end. Each of the outside lights will be provided with a cast iron protector hood painted with two coats of lead paint and sand, giving them the appearance of having been made out of concrete. The work will be done by the Central American Construction Co. The panel switches and operating apparatus were manufactured by the Crouse-Hinds Co., Syracuse, N. Y.

White Star Liner Britanic

The new White Star liner Britanic, building by Harland & Wolff, Belfast, Ireland, will be launched Feb. 26. She will have an inner shell rising from the tank top to the under side of the main or sixth deck. The shell starts from the after end of the

turbine engine room, and ends at the fore end of No. 1 hold, a length of slightly over 700 ft. Three ft. separate the inner skin from the outer shell, while the plating of the inner skin has been caulked so as to make it watertight. Along the 700 ft. referred to all athwartship bulkheads run right up to the main deck, instead of stopping, as in the Olympic, at the lower, second and third decks. The Britannic will possess many special features, including 300 staterooms with private baths.

Classified Advertisements

(Continued from page 30)

FOR SALE CHEAP — TWO MORRIS centrifugal pumps, size 12 x 14, direct connected to Armington-Sims center crank engine, 15 x 15. In first class condition, used only two years. Cost \$4,500, will sell for \$800, f. o. b. Cleveland. Subject to inspection and prior sale. W. H. Bosworth, Commercial Bank building, Cleveland, O.

FOR SALE:—ONE LARGE DERRICK scow and tug. New and in first class condition. Address England Towing Co., 614 Torrey building, Duluth, Minn.

FOR SALE: — PASSENGER STEAMER Nightingale. Length 87 ft., beam 14 ft., 75 passengers, 110 lb. steam, 37 tons net. Speed 12 miles. Fine working condition. No reasonable offer refused. For particulars address Henry S. Johnston, Box 476, Claytown, N. Y.

TUG FOR SALE OR TRADE FOR light draught steamer 75 ft. long, 18 ft. beam, hull rebuilt in 1913; boiler allowed 140 lbs. steam; 18 x 20 engine. Robert Martin, 26 Peterboro street, Detroit, Mich.

FOR SALE: — TWO STEAM CANAL boats (wooden) and eight consorts; built in 1910; steamers steeple compound surface condensing engines, 10 x 22 x 16. Best type of boiler, 150 lbs. steam, actual service 21 and 25 months respectively—first class order, full equipment. Consorts, Erie canal type; 11-ft. sides, high coamings (5 have steel hatches) capacity about 400 tons on 7½ ft. draught. All in New York harbor, and can be seen any time. Address Wm. Burrows, 18 Broadway, New York, N. Y.